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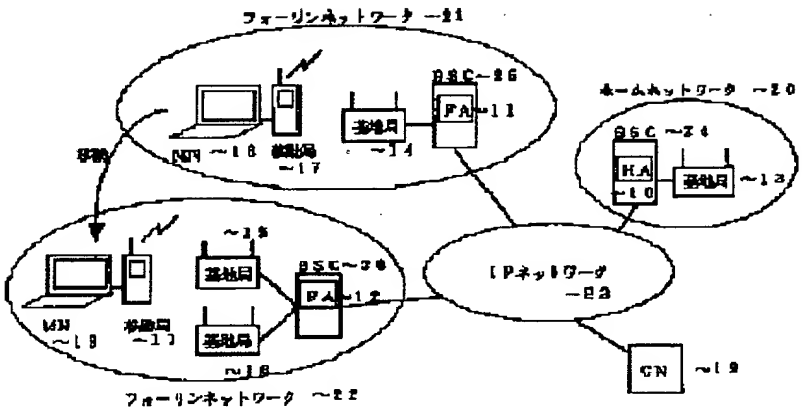




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JP11075245 A2
MOBILE TERMINAL POSITION REGISTRATION SYSTEM FOR MOBILE COMMUNICATION SYSTEM
MITSUBISHI ELECTRIC CORP
Inventor(s): ;KINOSHITA YUSUKE ;ITO SHUJI
Application No. 09233438 JP09233438 JP, Filed 19970829,

Abstract: PROBLEM TO BE SOLVED: To detect the movement of a mobile terminal while effectively using the band of a

radio channel by allowing the mobile station to transfers management information communicated between a base station and the mobile station to the connected mobile terminal and also allowing the mobile terminal to detect the movement of the mobile terminal between networks according to the transferred management information and registering the position at an agent.

SOLUTION: When a mobile station 17 and a mobile terminal MN 18 moves from a foreign network 21 to a foreign network 22, the mobile station 17 performs a hand-over operation and informs the MN 18 of the hand-over. The MN 8 sends a position registration message to a foreign agent FA 12 over a speaking channel and the FA 12 transfers it to a foreign agent HA 10. The HA 10 performs position registration so that the MN 18 is able to have a packet communication even in the network 22 at its destination. Messages need not be transmitted periodically and radio channels can effectively be used.

Int'l Class: H04Q00734; H04B00726 H04L01228

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Home Search List

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| (51)Int.Cl.[6] | 識別記号 | FI | |
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| H04B 7/26 | | | M |
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特許法第30条第１項適用申請有り　1997年３月６日　社団法人電子情報通信学会発行の「1997年電子情報通信学会総合大会講演論文集　通信１」に発表

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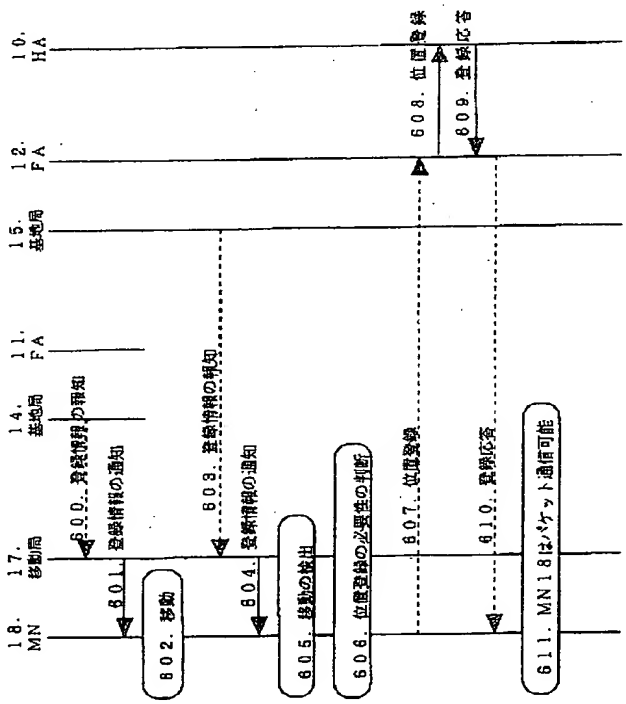
(54)【発明の名称】　移動体通信システムにおける移動端末の位置登録方式

(57)【要約】

【課題】　Ａｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージのブロードキャストを不要にして、無線チャネルの帯域有効利用を図り、また、通話チャネルを有効に利用しユーザデータのスループットの向上を図る。

【解決手段】　ＭＮ１８の移動の検出に移動局１７からの情報をトリガとして用いることにより、Ａｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージのブロードキャストを不要にし、また、位置登録に制御チャネルを用いることにより、通話チャネルを有効に利用する。



【特許請求の範囲】

【請求項１】　エージェントと基地局を有する複数のネットワークと、基地局と無線通信を行う移動局と、移動局に接続される移動端末とを備えた移動体通信システムにおける移動端末の位置登録方式において、移動局は、基地局と移動局との間で通信される管理情報を移動端末に転送し、上記移動端末は、転送された管理情報に基づいて移動端末のネットワーク間の移動を検出してエージェントに対して位置登録をすることを特徴とする移動体通信システムにおける移動端末の位置登録方式。

【請求項２】　上記管理情報は、移動局のハンドオーバ処理が発生したことを示す情報であることを特徴とする請求項１記載の移動体通信システムにおける移動端末の位置登録方式。

【請求項３】　上記管理情報は、移動局の位置登録処理が発生したことを示す情報であることを特徴とする請求項１記載の移動体通信システムにおける移動端末の位置登録方式。

【請求項４】　上記管理情報は、基地局から報知される基地局の識別子であることを特徴とする請求項１記載の移動体通信システムにおける移動端末の位置登録方式。

【請求項５】　上記管理情報は、基地局から報知される位置登録に用いる情報であることを特徴とする請求項１記載の移動体通信システムにおける移動端末の位置登録方式。

【請求項６】　上記移動局は、制御チャネルを用いて上記移動端末からのエージェントへの位置登録メッセージを送信して上記移動端末の位置登録を行うことを特徴とする請求項１～５いずれかに記載の移動体通信システムにおける移動端末の位置登録方式。

【請求項７】　上記移動局は、制御チャネルに報知される情報を管理情報として上記移動端末に転送し、上記移動端末は、制御チャネルに報知される情報に基づいて位置登録の必要性を判断することを特徴とする請求項１～６いずれかに記載の移動体通信システムにおける移動端末の位置登録方式。

【請求項８】　上記移動端末は、ネットワークのエージェントに問い合わせを行うことにより位置登録の必要性を判断することを特徴とする請求項１～６いずれかに記載の移動体通信システムにおける移動端末の位置登録方式。

【請求項９】　移動体通信システムは、パーソナルハンディホンシステム（ＰＨＳ）パケット通信システムにＩＥＴＦ（Ｉｎｔｅｒｎｅｔ　Ｅｎｇｉｎｅｅｒｉｎｇ　Ｔａｓｋ　Ｆｏｒｃｅ）のＭｏｂｉｌｅ－ＩＰを適用したシステムであることを特徴とする請求項１記載の移動体通信システムにおける移動端末の位置登録方式。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、例えば、ネットワーク内を自由に移動する移動局と、移動局に接続される移動端末（Ｍｏｂｉｌｅ　Ｎｏｄｅ：以下、MN）と、当該移動局と無線通信を行う基地局と、当該基地局を管理する基地局制御装置と、前記移動端末の位置管理を行うエージェントを有するＰＨＳ（パーソナルハンディホンシステム）のパケット通信システムにおける位置登録方式に関する。

【０００２】

【従来の技術】従来イーサネットによって構築されるＬＡＮ（ローカルエリアネットワーク）上で、ＩＰ（Ｉｎｔｅｒｎｅｔ　Ｐｒｏｔｏｃｏｌ）アドレスを持った端末がネットワークをまたがって移動した場合の通信を保証するために、ＩＥＴＦ（Ｉｎｔｅｒｎｅｔ　Ｅｎｇｉｎｅｅｒｉｎｇ　Ｔａｓｋ　Ｆｏｒｃｅ）では、Ｍｏｂｉｌｅ－ＩＰ（ＲＦＣ２００２、“ＩＰ　Ｍｏｂｉｌｉｔｙ　Ｓｕｐｐｏｒｔ”、ＲＦＣ：Ｒｅｑｕｅｓｔ　Ｆｏｒ　Ｃｏｍｍｅｎｔ）が提案されている。

【０００３】図１１に、上記Ｍｏｂｉｌｅ－ＩＰにおけるネットワーク構成を示す。MN１８は、ネットワークを移動する移動端末であり、ＣＮ（Ｃｏｒｒｅｓｐｏｎｄｅｎｔ　Ｎｏｄｅ）１９は、MN１８と通信を行う相手端末である。２０はＨＡ（Ｈｏｍｅ　Ａｇｅｎｔ）１０が管理し、MN１８におけるホームネットワーク、２１はＦＡ（Ｆｏｒｉｇｎ　Ａｇｅｎｔ）１１が管理するフォーリンネットワークである。また、２３はそれ以外のＩＰネットワークである。ＨＡ１０は、MN１８のホームネットワーク２０に存在し、MN１８が現在どのネットワークに接続しているかという位置登録情報を保持する。ＨＡ１０は、MN１８を宛先としたデータ（ＩＰパケット）をＣＮ１９から受信した場合、そのデータをMN１８が接続されているフォーリンネットワーク２１に配信する。これをトンネリングという。ＦＡ１１は、MN１８が一時的に接続されるフォーリンネットワーク２１に存在し、ＨＡ１０からトンネリングにより配信されたデータを受け取り、MN１８に引き渡す。ＨＡ１０からＦＡ１１へのMN１８を宛先とするデータの配信（トンネリング）は、カプセル化により行われる。カプセル化とは、MN１８を宛先とするデータの外側にＨＡ１０からＦＡ１１を宛先とするヘッダを付加することである。ＨＡ１０は、MN１８を宛先とするデータをカプセル化して、カプセル化したデータをＩＰネットワーク２３に出力する。ＦＡ１１は、ＩＰネットワーク２３からカプセル化されたデータを受け取り、デカプセル化してMN１８を宛先とするデータを取り出し、MN１８を宛先とするデータをMN１８に渡す。なお、ＨＡ１０とＦＡ１１を総称して、単にエージェントという。Ｍｏｂｉｌｅ－ＩＰではMN１８に対し、移動にかかわらず一定不変の固定ＩＰアドレス（ホームアドレス）と、ネットワークをまたがった移動時に割り当てられる可変ＩＰアドレス（気付けアドレス）の２つを割り当て、上記M

Ｎ１８は、上記２つのアドレスをホームのネットワークに存在するＨＡ１０と移動先のネットワークを管理しているＦＡ１１に位置登録する。ＭＮ１８がフォーリンネットワーク２１に存在する場合、ＣＮ１９から上記ＭＮ１８のホームアドレスを指定してＩＰパケットを送信すると、当該ＩＰパケットは、上記ＨＡ１０からＦＡ１１へトンネリングされ、ＦＡ１１から上記宛先となるＭＮ１８まで配送される。

【０００４】また、図１１に示すように、ＭＮ１８がホームネットワーク２０からフォーリンネットワーク２１のように管理しているエージェントの異なるネットワークに移動した場合においては、上記ＭＮ１８の気付けアドレスの登録変更の必要性があるので、上記ＨＡ１０及びＦＡ１１に対し、位置登録が必要となり、上記移動の検出をＭＮ１８で行い、ＭＮ１８から上記ＨＡ１０及びＦＡ１１に対し、位置登録を行う必要がある。

【０００５】図１１に示すように、ＭＮ１８がホームネットワーク２０からフォーリンネットワーク２１へ移動した場合、Ｍｏｂｉｌｅ－ＩＰにおける移動の検出と位置登録のシーケンスを図１２に示す。図１２において、ＨＡ１０は、図１５に示すフォーマットで１０００～１００２のＩＣＭＰ（Ｉｎｔｅｒｎｅｔ　Ｃｏｎｔｒｏｌ　Ｍｅｓｓａｇｅ　Ｐｒｏｔｏｃｏｌ）のＲｏｕｔｅｒ　Ｄｉｓｃｏｖｅｒｙを拡張したＡｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージを周期的にブロードキャストしている。Ａｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージは、エージェントのサービス内容を知らせるメッセージである。ＭＮ１８は、Ａｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージを用いて、現在の接続されているエージェントを知ることができる。このようにして、ＭＮ１８は、上記メッセージをＭＮ１８が受信することにより、現在位置を知る。１００３においてＭＮ１８は、ホームネットワーク２０からフォーリンネットワーク２１へ移動する。すると、ＭＮ１８は、ＦＡ１１より周期的に出力されている１００４のＡｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージを受信することにより、現在位置を知ると共に、ＭＮ１８がホームネットワーク２０からフォーリンネットワーク２１へ移動したことを検出する。移動を検出したＭＮ１８は、ＦＡ１１に対し、図１３に示すフォーマットで１００６の位置登録メッセージを送信する。１００６の位置登録メッセージを受けたＦＡ１１は、ＨＡ１０に１００７の位置登録メッセージを転送する。１００７の位置登録メッセージを受信した上記ＨＡ１０は、ＭＮ１８がフォーリンネットワーク２１でもパケット通信を行えるように位置登録処理を行った後、図１４に示すフォーマットで１００８の登録応答メッセージを送信する。１００８による登録応答メッセージを受信したＦＡ１１は、１００９の登録応答メッセージをＭＮ１８へ送信し、ＭＮ１８は登録応答メッセージを受信する。上記により位置登録を完了し、１０１０においてＭＮ１８は、パケット通信が可能となる。

【０００６】

【発明が解決しようとする課題】しかし、ＰＨＳパケット通信システムにおいては、ネットワークが無線で構成されており、上記Ａｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージをネットワーク上に周期的にブロードキャストすることは、無線チャネルの帯域有効利用の観点から問題があった。この発明は、以上のような問題点を解決するためになされたものであり、無線通信システムにおける無線チャネルの帯域の有効利用を図りながら、移動端末の移動検出を行える位置登録方式を得ることを目的とする。

【０００７】

【課題を解決するための手段】この発明に係る移動体通信システムにおける移動端末の位置登録方式は、エージェントと基地局を有する複数のネットワークと、基地局と無線通信を行う移動局と、移動局に接続される移動端末とを備えた移動体通信システムにおける移動端末の位置登録方式において、移動局は、基地局と移動局との間で通信される管理情報を移動端末に転送し、上記移動端末は、転送された管理情報に基づいて移動端末のネットワーク間の移動を検出してエージェントに対して位置登録をすることを特徴とする。

【０００８】上記管理情報は、移動局のハンドオーバ処理が発生したことを示す情報であることを特徴とする。

【０００９】上記管理情報は、移動局の位置登録処理が発生したことを示す情報であることを特徴とする。

【００１０】上記管理情報は、基地局から報知される基地局の識別子であることを特徴とする。

【００１１】上記管理情報は、基地局から報知される位置登録に用いる情報であることを特徴とする。

【００１２】上記移動局は、制御チャネルを用いて上記移動端末からのエージェントへの位置登録メッセージを送信して上記移動端末の位置登録を行うことを特徴とする。

【００１３】上記移動局は、制御チャネルに報知される情報を管理情報として上記移動端末に転送し、上記移動端末は、制御チャネルに報知される情報に基づいて位置登録の必要性を判断することを特徴とする。

【００１４】上記移動端末は、ネットワークのエージェントに問い合わせを行うことにより位置登録の必要性を判断することを特徴とする。

【００１５】上記移動体通信システムは、パーソナルハンディホンシステム（ＰＨＳ）パケット通信システムにＩＥＴＦ（Ｉｎｔｅｒｎｅｔ　Ｅｎｇｉｎｅｅｒｉｎｇ　Ｔａｓｋ　Ｆｏｒｃｅ）のＭｏｂｉｌｅ－ＩＰを適用したシステムであることを特徴とする。

【００１６】

【発明の実施の形態】

実施の形態１．以下、図面に基づいて、本発明の一例としてＰＨＳパケット通信システムにおける位置登録方式について説明する。図１は、ＰＨＳパケット通信システムの一実施の形態を示すネットワーク構成図である。図１において、ホームネットワーク２０は、基地局１３と、ＩＰネットワーク２３に接続される基地局１３を収容する基地局制御装置（Ｂａｓｅ　Ｓｔａｔｉｏｎ　Ｃｏｎｔｒｏｌｌｅｒ：以下、ＢＳＣ）２４とから構成され、ＢＳＣ２４の管理する無線ゾーンである。ＢＳＣ２４は、Ｍｏｂｉｌｅ－ＩＰのエージェントであるＨＡ１０の機能を備えている。また、フォーリンネットワーク２１は、基地局１４と、Ｍｏｂｉｌｅ－ＩＰのエージェントであるＦＡ１１を備えたＢＳＣ２５とから構成され、移動局１７及びＭＮ１８が移動前に存在していたネットワークであり、ＢＳＣ２５の管理する無線ゾーンである。同様に、フォーリンネットワーク２２は、基地局１５～１６と、Ｍｏｂｉｌｅ－ＩＰのエージェントであるＦＡ１２を備えたＢＳＣ２６とから構成され、移動局１７及びＭＮ１８が移動後に存在するネットワークであり、ＢＳＣ２６の管理する無線ゾーンである。また、ＩＰネットワーク２３に接続され、ＭＮ１８とパケット通信を行う相手端末（Ｃｏｒｒｅｓｐｏｎｄｅｎｔ　Ｎｏｄｅ：以下ＣＮ）１９が存在している。

【００１７】Ｍｏｂｉｌｅ－ＩＰでは、移動端末に対するＩＰパケット転送機能をエージェントによるパケットのカプセル化によるトンネリングで実現する。エージェントには、移動端末の現在位置を管理するＨＡと移動先のサブネットワークにおいて、移動端末を管理するＦＡがある。ＨＡとＦＡのパケット転送時の動作について、以下に示す。

ＨＡ：移動端末宛のＩＰパケットをカプセル化し、ＦＡに転送する。

ＦＡ：転送されたパケットから元のＩＰパケットを抽出し、移動端末に送信する。

ＰＨＳパケット通信システムのパケット転送機能を実現するには、ＩＰパケットの転送を行うエージェントとＰＨＳネットワークのインタワークが必要である。そのため、本システムでは、エージェントとＰＨＳネットワークのインタワークの簡略化のために、エージェントをＢＳＣに配置する。これにより、図１のＩＰネットワークに機能追加等の影響を与えず、また、ＦＡにおいて、ＦＡからＢＳＣへのＩＰパケットルーチング情報を新規に必要とすることなく、当該ＩＰパケット転送機能を実現できる。

【００１８】前述のパケット転送機能を実現し、モビリティ機能を提供するには、システムに移動端末の移動管理機能が必要である。Ｍｏｂｉｌｅ－ＩＰでは、ＩＣＭＰ（Ｉｎｔｅｒｎｅｔ　Ｃｏｎｔｒｏｌ　Ｍｅｓｓａｇｅ　Ｐｒｏｔｏｃｏｌ）によるＲｏｕｔｅｒ　Ｄｉｓｃｏｖｅｒｙを拡張したＡｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔ／Ｓｏｌｉｃｉｔａｔｉｏｎを用いて移動を検出し、登録を行う。ＰＨＳパケット通信システムに、本手順であるＡｇｅｎｔ　ＡｄｖｅｒｔｉｓｅｍｅｎｔをＩＰパケットとして一定間隔でブロードキャストすることは、無線チャネルの帯域有効利用の観点から適切ではない。そこで、本システムでは、ＰＨＳによる移動のための管理情報を用いて位置情報を取得し、ＢＳＣ間をまたがる移動の検出をトリガとしてＭｏｂｉｌｅ－ＩＰにおける登録を行う。これにより、本システムの移動管理機能に、移動局のＰＳ番号（電話番号）と移動端末のＩＰアドレスに直接的な関連を持たせないことが可能になる。

【００１９】図２は、図１に示すネットワーク構成において、上記ＭＮ１８が上記ＣＮ１９と通信を行いながら、フォーリンネットワーク２１からフォーリンネットワーク２２に移動した場合の位置登録シーケンスを示すものである。次に、図１に示すＰＨＳパケット通信システムにおける位置登録方式を、図２を用いて説明する。

【００２０】図２の１００においては、ＣＮ１９がＩＰネットワーク２３、ＨＡ１０、ＦＡ１１、基地局１４、移動局１７を経由して、ＭＮ１８とパケット通信を行っている。１０１では、移動局１７及びＭＮ１８がフォーリンネットワーク２１からフォーリンネットワーク２２へ移動する。１０２で、当該移動局１７は、１０１の移動によりハンドオーバを行う。１０３では、当該移動局１７が当該ＭＮ１８にハンドオーバしたことを通知する。上記ＭＮ１８は１０４において、移動局１７がハンドオーバしたことを知ることによって、ネットワーク間の移動を検出する。

【００２１】移動を検出したＭＮ１８は、ＦＡ１２に対し、１０５の位置登録メッセージを通話チャネルを用いて送信する。このＭｏｂｉｌｅ－ＩＰの位置登録メッセージのフォーマットを、図１３に示す。１０５の位置登録メッセージを受けた上記ＦＡ１２は、ＨＡ１０に１０６の位置登録メッセージを転送する。１０６の位置登録メッセージを受信した上記ＨＡ１０は、ＭＮ１８が移動先フォーリンネットワーク２２でもパケット通信を行えるように位置登録処理を行った後、１０７の登録応答メッセージを送信する。このＭｏｂｉｌｅ－ＩＰの登録応答メッセージのフォーマットを、図１４に示す。１０７による登録応答メッセージを受信したＦＡ１２は、１０８の登録応答メッセージを通話チャネルを用いてＭＮ１８へ送信し、ＭＮ１８は登録応答を受信する。上記により位置登録を完了し１０９において、ＣＮ１９はＩＰネットワーク２３、ＨＡ１０、ＦＡ１２、基地局１５、移動局１７を経由して、ＭＮ１８とパケット通信中になる。

【００２２】以上のように、この実施の形態では、移動局を接続したパーソナルコンピュータ（ＰＣ）などの移動端末ＭＮの移動時、もしくは、移動局の機能を付加し

たＭＮの移動時に、移動先のネットワークで端末の移動の管理を行い、当該ＩＰアドレスを含むＩＰヘッダでカプセル化されたＩＰヘッダを削除してＭＮにＩＰパケットを渡すフォーリンエージェントと、ＭＮが本来存在するネットワークでＭＮの移動を管理し、及び移動時にＩＰパケット転送を可能とするために、割り当てられたＩＰアドレスを管理し、移動したＭＮ宛のＩＰパケットを受信した場合、当該ＭＮに割り当てられたＩＰアドレスを含むＩＰヘッダでカプセル化するホームエージェントを具備するＰＨＳパケット通信ネットワークシステムにおいて、ＭＮがパケット通信中に移動した場合、移動局のハンドオーバを契機として、ＭＮが、ＨＡ、もしくは、ＦＡに位置登録を行うことを特徴とする。

【００２３】以上のような構成により、ＰＨＳパケット通信システムにＩＥＴＦ（Ｉｎｔｅｒｎｅｔ Ｅｎｇｉｎｅｅｒｉｎｇ Ｔａｓｋ Ｆｏｒｃｅ）のＭｏｂｉｌｅ－ＩＰの適用が可能になる。即ち、ＰＨＳパケット通信システムにおいて、移動端末のユーザに対し、移動を隠蔽することができ、移動端末に付与したＩＰアドレスを移動先のネットワークで変更せずに通信できる。このシステムの特徴は、移動局１７の移動をトリガとしてＭＮの移動を検出するものである。従って、メッセージを周期的に送信する必要がなくなり、無線チャネルを有効に使える。

【００２４】実施の形態２．図３は、図１に示すネットワーク構成において、上記移動局１７の電源がＯＮの状態で、かつ、上記ＭＮ１８が通信を行っていない状態で、フォーリンネットワーク２１からフォーリンネットワーク２２に移動した場合の位置登録シーケンスを示すものである。

【００２５】図３の２００において、移動局１７及びＭＮ１８は、フォーリンネットワーク２１からフォーリンネットワーク２２へ移動する。２０１で、移動局１７は自らの存在する無線ゾーンを移動したことを知り、移動局としての位置登録を基地局１５（又は基地局１６）に対して行う。２０２において、移動局１７はＭＮ１８に対し、移動局１７は位置登録を行ったことを通知する。２０３において、ＭＮ１８は、接続している移動局１７が新たな位置登録を行ったことを知ることにより、ネットワーク間を移動したことを検出する。

【００２６】移動したことを検出したＭＮ１８は、移動先ネットワークのＦＡ１２に対して、２０４の位置登録メッセージを通話チャネルを用いて送信する。２０４の位置登録メッセージを受信したＦＡ１２は、２０５の位置登録メッセージをＨＡ１０に対して転送する。２０５の位置登録メッセージを受信したＨＡ１０は、ＭＮ１８が移動先フォーリンネットワーク２２でもパケット通信を行えるように、位置登録処理を行った後、２０６の登録応答メッセージをＦＡ１２に送信する。２０６による登録応答メッセージを受信したＦＡ１２は、２０７の登録応答メッセージを通話チャネルを用いてＭＮ１８へ送信し、ＭＮ１８は登録応答メッセージを受信する。上記により、２０８において、位置登録を完了し、ＭＮ１８はパケット通信を行うことが可能になる。

【００２７】実施の形態３．図４は、図１に示すネットワーク構成において、上記ＭＮ１８がフォーリンネットワーク２１からフォーリンネットワーク２２に移動し、位置登録メッセージの送受信に制御チャネルを用いて位置登録を行った場合の位置登録シーケンスを示すものである。図中、破線の矢印は、制御チャネルを用いた位置登録メッセージの通信を示している。

【００２８】図４の３００において、移動局１７及びＭＮ１８は、フォーリンネットワーク２１からフォーリンネットワーク２２へ移動する。３０１で、移動局１７は自らの存在する無線ゾーンを移動したことを知り、移動局としての位置登録を行う。３０２において、移動局１７はＭＮ１８に対し、移動局１７は位置登録を行ったことを通知する。３０３において、ＭＮ１８は、接続している移動局１７が位置登録を行ったことを知ることにより、移動したことを検出する。

【００２９】移動したことを検出したＭＮ１８は、移動先ネットワークのＦＡ１２に対して、３０４の位置登録メッセージを制御チャネルを用いて送信する。３０４の位置登録メッセージを受信したＦＡ１２は、３０５の位置登録メッセージをＨＡ１０に対して転送する。３０５の位置登録メッセージを受信したＨＡ１０は、ＭＮ１８が移動先フォーリンネットワーク２２でもパケット通信を行えるように、位置登録処理を行った後、３０６の登録応答メッセージをＦＡ１２に送信する。３０６による登録応答メッセージを受信したＦＡ１２は、３０７の登録応答メッセージをＭＮ１８へ制御チャネルを用いて送信し、ＭＮ１８は登録応答メッセージを受信する。上記により、３０８において、位置登録を完了し、ＭＮ１８はパケット通信を行うことが可能になる。

【００３０】実施の形態４．図５は、図１に示すネットワーク構成において、上記ＭＮ１８がフォーリンネットワーク２１からフォーリンネットワーク２２に移動し、制御チャネルを用いて基地局から移動局に報知されている情報から、ＭＮは移動を検出した場合の位置登録シーケンスを示すものである。ここで、上記基地局から移動局に報知されている報知情報の中に、基地局の識別子であるＣＳ－ＩＤがある。図６に、基地局１３～１６に割り当てられたＣＳ－ＩＤの対応表を示す。図６より、例えば、基地局１４は、ＣＳ－ＩＤとして“１１００”が割り当てられ、基地局１５は、“１２００”が割り当てられている。

【００３１】図５の４００において、基地局１４から移動局１７に対して情報が報知されている。上記報知情報中には、基地局１４のＣＳ－ＩＤが含まれ、その値は図６より“１１００”である。４０１において、移動局１

７はＭＮ１８に対して、現在存在するゾーンのＣＳ－ＩＤが“１１００”であることを通知する。４０２では、移動局１７及びＭＮ１８は、フォーリンネットワーク２１からフォーリンネットワーク２２へ移動する。４０３において、移動局１７は、基地局１５より報知情報を受信し、基地局１５のＣＳ－ＩＤ“１２００”を取得する。４０４において、移動局１７は、ＭＮ１８に対して、現在存在するゾーンのＣＳ－ＩＤが“１２００”であることを通知する。上記ＣＳ－ＩＤの変化により、４０５において、ＭＮ１８はネットワーク間の移動を検出する。

【００３２】ＭＮ１８は、移動先ネットワークのＦＡ１２に対して４０６の位置登録メッセージを制御チャネルを用いて送信する。４０６の位置登録メッセージを受信したＦＡ１２は、４０７の位置登録メッセージをＨＡ１０に対して転送する。４０７の位置登録メッセージを受信したＨＡ１０は、ＭＮ１８が移動先フォーリンネットワーク２２でもパケット通信を行えるように位置登録処理を行った後、４０８の登録応答メッセージをＦＡ１２に送信する。４０８の登録応答メッセージを受信したＦＡ１２は、４０９の登録応答メッセージをＭＮ１８へ制御チャネルを用いて送信し、ＭＮ１８は登録応答メッセージを受信する。上記により、４１０において、位置登録を完了し、ＭＮ１８はパケット通信を行うことが可能になる。

【００３３】実施の形態５．図７は、図１に示すネットワーク構成において、上記ＭＮ１８がフォーリンネットワーク２２に存在し、制御チャネルを用いて基地局から移動局に位置登録に用いる情報を報知させ、当該情報を位置登録時に利用した場合の位置登録シーケンスを示すものである。上記基地局から移動局に報知させる情報の中に、ＨＡ及びＦＡのＩＰアドレスを定義する。図８に、ＨＡ１０及びＦＡ１１，１２に割り当てたＩＰアドレスの対応表を示す。図８より、例えば、ＦＡ１１には、ＩＰアドレスとして“１３３．１４２．１１．１”が割り当てられ、ＦＡ１２には、ＩＰアドレスとして“１３３．１４３．１２．１”が割り当てられている。

【００３４】図７の５００において、基地局１５から移動局１７に対して位置登録に用いる情報が報知されている。上記報知情報中には、ＦＡ１２のＩＰアドレスが含まれ、図８より、その値は“１３３．１４３．１２．１”である。５０１においては、移動局１７は、ＭＮ１８に対して、現在存在しているネットワークのＦＡのＩＰアドレスが“１３３．１４３．１２．１”であることを通知する。ＭＮ１８は、５０１で取得したＩＰアドレス“１３３．１４３．１２．１”を図１３の位置登録メッセージの気付けアドレス（Ｃａｒｅ－ｏｆ　Ａｄｄｒｅｓｓ）に設定し、ＦＡ１２に対して５０２の位置登録メッセージを制御チャネルを用いて送信する。５０２の位置登録メッセージを受信したＦＡ１２は、５０３の位置登録メッセージをＨＡ１０に対して転送する。５０３の位置登録メッセージを受信したＨＡ１０は、ＭＮ１８が移動先フォーリンネットワーク２２でもパケット通信を行えるように、位置登録処理を行った後、５０４の登録応答メッセージをＦＡ１２に送信する。５０４による登録応答メッセージを受信したＦＡ１２は、５０５の登録応答メッセージをＭＮ１８へ制御チャネルを用いて送信し、ＭＮ１８は登録応答メッセージを受信する。上記により、５０６において、位置登録を完了し、ＭＮ１８はパケット通信を行うことが可能になる。

【００３５】実施の形態６．図９は、図１に示すネットワーク構成において、上記ＭＮ１８がフォーリンネットワーク２１からフォーリンネットワーク２２に移動し、制御チャネルを用いて基地局から移動局に位置登録に用いる情報を報知させた場合の位置登録シーケンスを示すものである。

【００３６】図９の６００において、基地局１４から移動局１７に対して位置登録に用いる情報が報知されている。上記報知情報中には、ＦＡ１１のＩＰアドレスが含まれ、その値は“１３３．１４２．１１．１”である。６０１において、移動局１７はＭＮ１８に対して、現在ＩＰアドレスが“１３３．１４２．１１．１”であるＦＡ１１のエリアに存在していることを通知する。

【００３７】６０２において、移動局１７及びＭＮ１８は、フォーリンネットワーク２１からフォーリンネットワーク２２へ移動する。６０３においては、上記６００と同様に、基地局１５から移動局１７に対して位置登録に用いる情報が、制御チャネルを用いて報知されている。上記報知情報中には、ＦＡ１２のＩＰアドレスが含まれ、その値は“１３３．１４３．１２．１”である。６０１において、移動局１７は、ＭＮ１８に対して、現在ＩＰアドレスが“１３３．１４３．１２．１”であるＦＡ１２のエリアに存在していることを通知する。６０５において、ＭＮ１８は、上記ＦＡのＩＰアドレスが“１３３．１４２．１１．１”から“１３３．１４３．１２．１”に変化したことから、フォーリンネットワーク２１からフォーリンネットワーク２２へ移動したことを検出する。６０６において、ＭＮ１８は、異なるエージェントの管理するネットワークへ移動したことを検出しているので、位置登録が必要だと判断する。

【００３８】６０６の位置登録の必要性の判断は、前述した各実施の形態にも適用できる。ＭＮ１８が基地局１５の無線ゾーンから基地局１６の無線ゾーンへ移動した場合、即ち、ハンドオーバが行われたり、位置登録が行われたり、ＣＳ－ＩＤが変更された場合でも、ＦＡのＩＰアドレスが、“１３３．１４３．１２．１”のままならば、位置登録をする必要がないと判断することができる。このように、移動局１７の移動検出がそのままＭＮ１８の移動検出とはならない場合がある。即ち、移動局１７の移動検出とＭＮ１８の移動検出は分離されたもの

であり、移動局１７の移動検出をトリガとしてＭＮ１８の移動検出を別途実行することになる。

【００３９】ＭＮ１８は、６０４で取得したＩＰアドレス“１３３．１４３．１２．１”を図１３の位置登録メッセージの気付けアドレス（Ｃａｒｅ－ｏｆ　Ａｄｄｒｅｓｓ）に設定し、ＦＡ１２に対して６０７の位置登録メッセージを制御チャネルを用いて送信する。６０７の位置登録メッセージを受信したＦＡ１２は、６０８の位置登録メッセージをＨＡ１０に対して転送する。６０８の位置登録メッセージを受信したＨＡ１０は、ＭＮ１８が移動先フォーリンネットワーク２２でもパケット通信を行えるように、位置登録処理を行った後、６０９の登録応答メッセージをＦＡ１２に送信する。６０９による登録応答メッセージを受信したＦＡ１２は、６１０の登録応答メッセージをＭＮ１８へ制御チャネルを用いて送信し、ＭＮ１８は登録応答メッセージを受信する。上記により、６１１において、位置登録を完了し、ＭＮ１８はパケット通信を行うことが可能になる。

【００４０】実施の形態７．図１０は、図１に示すネットワーク構成において、上記ＭＮ１８がフォーリンネットワーク２１からフォーリンネットワーク２２に移動し、ＭＮ１８はエージェントからの情報により、位置登録の必要性を判断した後に、位置登録を行う場合のシーケンスを示すものである。

【００４１】図１０の７００においては、移動局１７及びＭＮ１８は、フォーリンネットワーク２１からフォーリンネットワーク２２へ移動する。７０１で、移動局１７は自らの存在する無線ゾーンを移動したことを知り、移動局としての位置登録を行う。７０２において、移動局１７はＭＮ１８に対し、移動局１７が位置登録を行ったことを通知する。７０３において、ＭＮ１８は、接続している移動局１７が位置登録を行ったことを知ることにより、移動したことを検出する。

【００４２】移動を検出したＭＮ１８は、ＦＡ１２に対して、図１６に示すフォーマットで７０４のＡｇｅｎｔ　Ｓｏｌｉｃｉｔａｔｉｏｎメッセージを送信する。Ａｇｅｎｔ　Ｓｏｌｉｃｉｔａｔｉｏｎメッセージは、Ａｇｅｎｔ　Ｓｏｌｉｃｉｔａｔｉｏｎメッセージの発行を要求するメッセージである。７０４のＡｇｅｎｔＳｏｌｉｃｉｔａｔｉｏｎメッセージを受信したＦＡ１２は、図１５に示すフォーマットで７０５のＡｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージを送信する。７０６において、ＭＮ１８は、７０５のＡｇｅｎｔ　Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージの情報より、位置登録が必要性を判断する。位置登録が必要な場合、ＭＮ１８はＦＡ１２に対して、７０７の位置登録メッセージを制御チャネルを用いて送信する。７０７の位置登録メッセージを受信したＦＡ１２は、７０８において、位置登録メッセージをＨＡ１０に対して転送する。７０８の位置登録メッセージを受信したＨＡ１０は、ＭＮ１８が移動先フォーリンネットワーク２２でもパケット通信を行えるように位置登録処理を行った後、７０９の登録応答メッセージをＦＡ１２に送信する。７０９による登録応答メッセージを受信したＦＡ１２は、７１０の登録応答メッセージをＭＮ１８へ制御チャネルを用いて送信し、ＭＮ１８は登録応答メッセージを受信する。７１１の時点で、ＭＮ１８は位置登録を完了し、ＭＮ１８はパケット通信を行うことが可能になる。

【００４３】

【発明の効果】この発明によれば、ＭＮの移動の検出に移動局からの情報をトリガとして用いることにより、ＨＡ及びＦＡとＭＮ間のメッセージのブロードキャストの問題を解決することができ、また、無線リソースの有効利用を図ることができる。

【００４４】また、ＭＮがパケット通信中に移動した場合、移動局のハンドオーバを契機として、ＭＮはＨＡ、もしくは、ＦＡに位置登録を行える。

【００４５】また、ＭＮが通信中以外に移動した場合、移動局の位置登録処理を契機として、ＭＮはＨＡ、もしくは、ＦＡに位置登録を行える。

【００４６】また、制御チャネル上に報知されている位置情報の中の基地局のＩＤからＭＮは移動を検出し、当該ＭＮはＨＡ、もしくは、ＦＡに位置登録を行える。

【００４７】また、位置登録処理に用いる情報を制御チャネル上に報知し、ＭＮは前記報知情報を用いてＨＡ、もしくは、ＦＡに位置登録を行える。

【００４８】また、位置登録に通話チャネルではなく制御チャネルを用いることにより、通話チャネルの有効利用を図ることができ、ユーザデータのスループットを上げることができる。

【００４９】そして、位置登録を行う際に、制御チャネルの情報からその必要性を判断することにより、無駄な位置登録を避けることができるという効果がある。

【００５０】そして、位置登録を行う際に、エージェントの情報からその必要性を判断することにより、無駄な位置登録を避けることができるという効果がある。

【００５１】また、この発明によれば、ＰＨＳネットワークにＩＥＴＦのＭｏｂｉｌｅ－ＩＰを適用できるという効果がある。

【図面の簡単な説明】

【図１】　この発明におけるＰＨＳパケット通信システムのネットワーク構成図である。

【図２】　この発明の実施の形態１における位置登録シーケンスを示す図である。

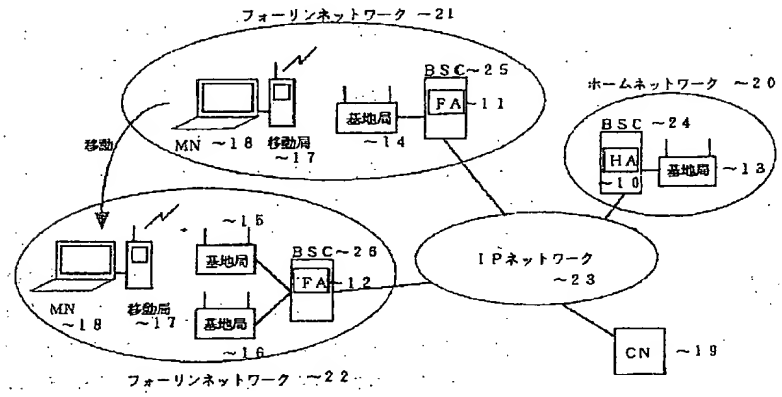
【図３】　この発明の実施の形態２における位置登録シーケンスを示す図である。

【図４】　この発明の実施の形態３における位置登録シーケンスを示す図である。

【図５】　この発明の実施の形態４における位置登録シーケンスを示す図である。

【図６】　この発明の実施の形態４における基地局とＣＳ－ＩＤの対応表を示す図である。
【図７】　この発明の実施の形態５における位置登録シーケンスを示す図である。
【図８】　この発明の実施の形態５におけるＡｇｅｎｔとＡｇｅｎｔのＩＰアドレスの対応表を示す図である。
【図９】　この発明の実施の形態６における位置登録シーケンスを示す図である。
【図１０】　この発明の実施の形態７における位置登録シーケンスを示す図である。
【図１１】　従来のＭｏｂｉｌｅ－ＩＰにおけるネットワーク構成図である。
【図１２】　従来のＭｏｂｉｌｅ－ＩＰにおける位置登録シーケンスを示す図である。
【図１３】　Ｍｏｂｉｌｅ－ＩＰにおける位置登録メッセージフォーマットを示す図である。
【図１４】　Ｍｏｂｉｌｅ－ＩＰにおける登録応答メッセージフォーマットを示す図である。
【図１５】　Ｍｏｂｉｌｅ－ＩＰにおけるＡｇｅｎｔ Ａｄｖｅｒｔｉｓｅｍｅｎｔメッセージフォーマットを示す図である。
【図１６】　Ｍｏｂｉｌｅ－ＩＰにおけるＡｇｅｎｔ Ｓｏｌｉｃｉｔａｔｉｏｎメッセージフォーマットを示す図である。
【符号の説明】
１０　ＨＡ（ホームエージェント）、１１，１２　ＦＡ（フォーリンエージェント）、１３～１６　基地局、１７　移動局、１８　ＭＮ（移動端末）、１９ＣＮ、２０　ホームネットワーク、２１，２２　フォーリンネットワーク、２３ＩＰネットワーク。

【図１】



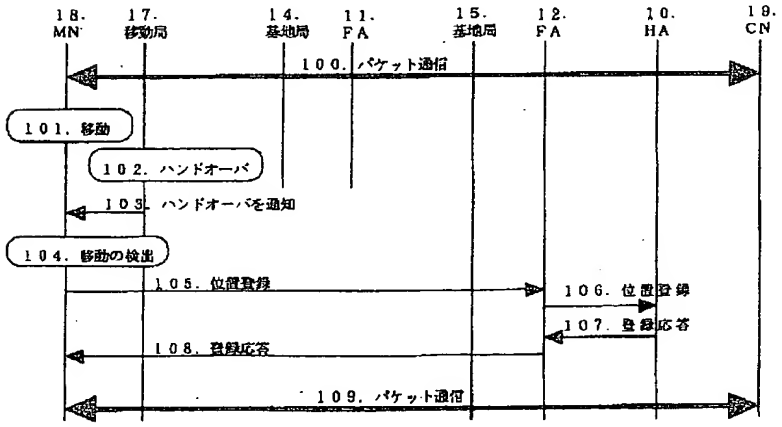

【図６】

| 基地局 | CS－ID |
|---|---|
| 基地局　13 | 1000 |
| 基地局　14 | 1100 |
| 基地局　15 | 1200 |
| 基地局　16 | 1300 |

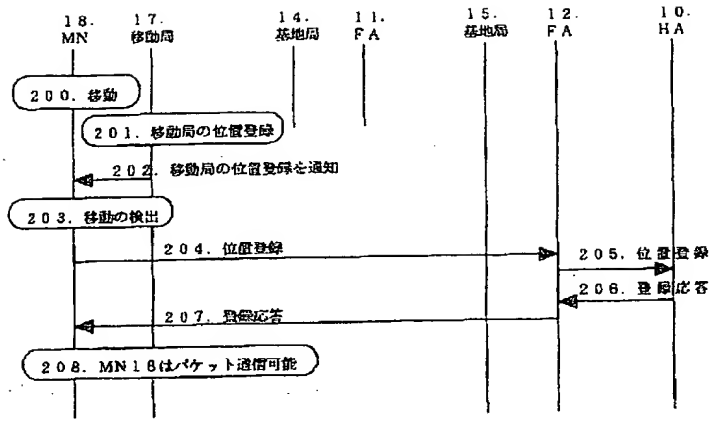
【図８】

| Agent | AgentのIPアドレス |
|---|---|
| HA　10 | 133. 141. 10. 1 |
| FA　11 | 133. 142. 11. 1 |
| FA　12 | 133. 143. 12. 1 |

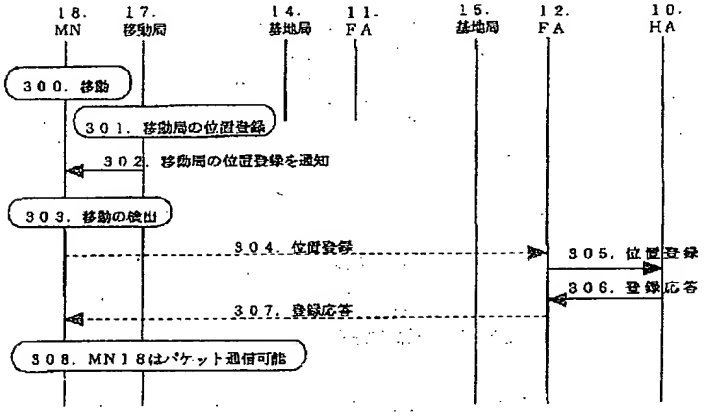
【図２】



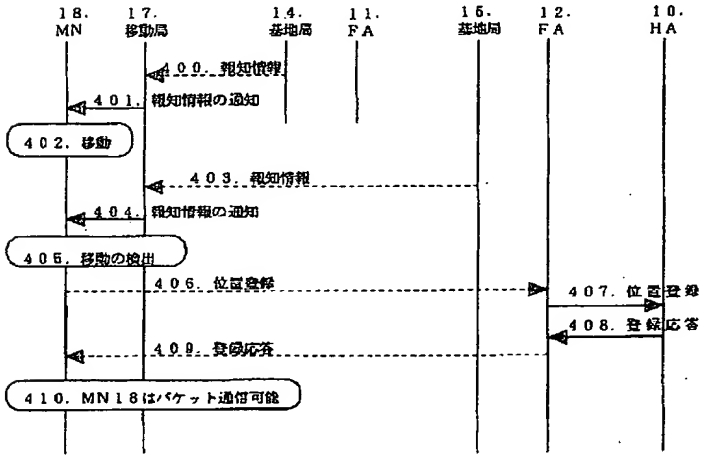
【図３】



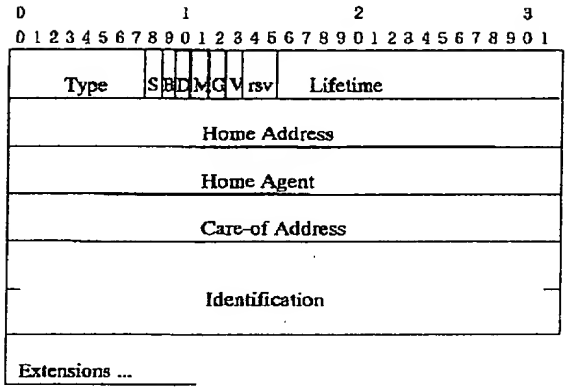

【図４】



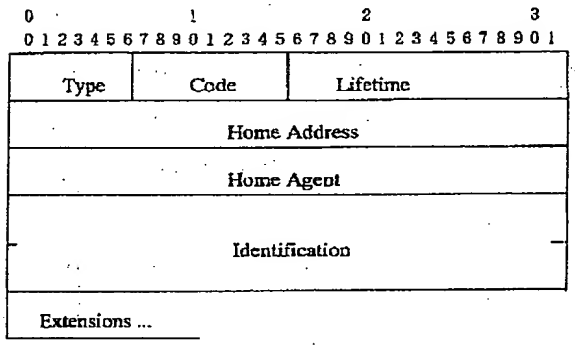

【図５】



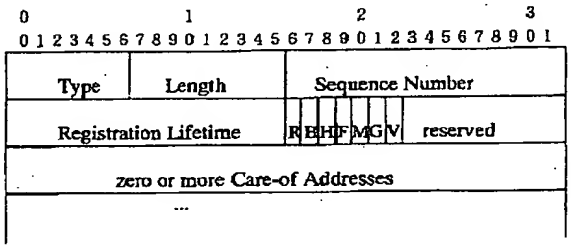

【図１３】



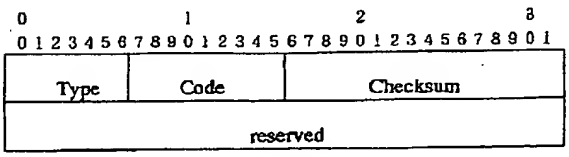

【図１４】



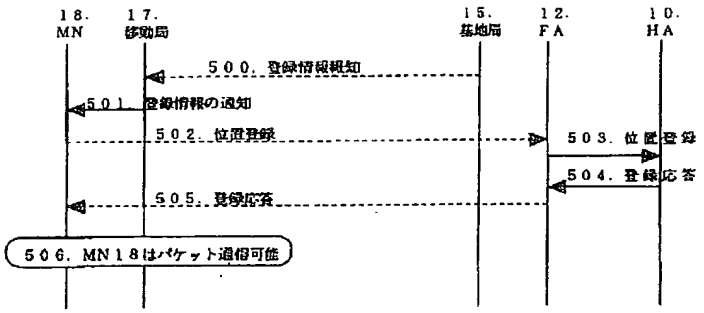

【図１５】



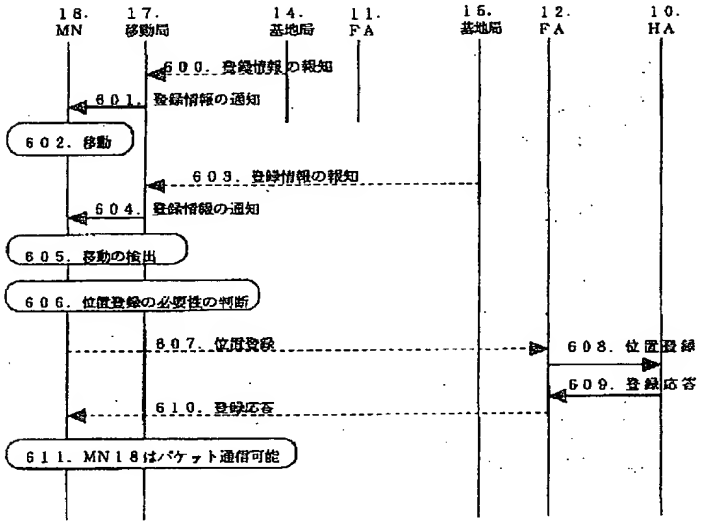

【図１６】



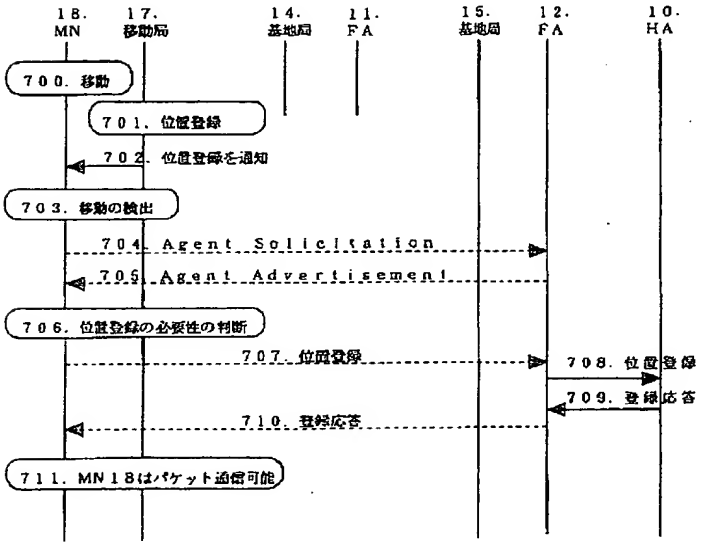
【図７】


18.
MN
17.
移動局
15.
基地局
12.
FA
10.
HA
500. 登録情報報知
501. 登録情報の通知
502. 位置登録
503. 位置登録
504. 登録応答
505. 登録応答
506. MN18はパケット通信可能

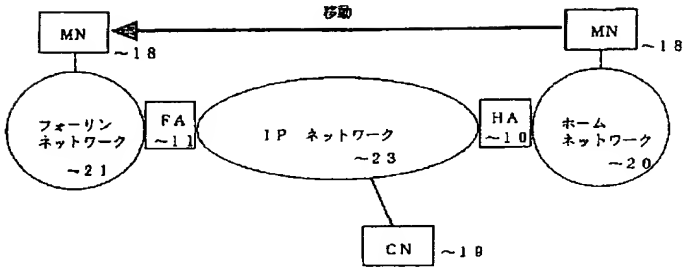
【図９】


18.
MN
17.
移動局
14.
基地局
11.
FA
15.
基地局
12.
FA
10.
HA
600. 登録情報の報知
601. 登録情報の通知
602. 移動
603. 登録情報の報知
604. 登録情報の通知
605. 移動の検出
606. 位置登録の必要性の判断
607. 位置登録
608. 位置登録
609. 登録応答
610. 登録応答
611. MN18はパケット通信可能

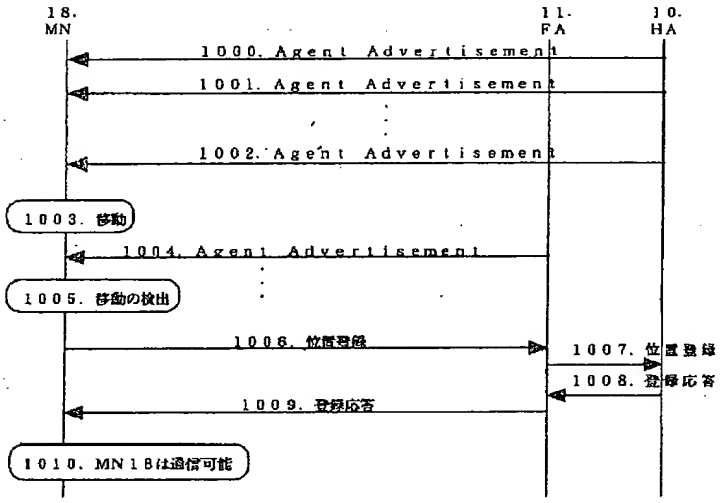
【図１０】


18.
MN
17.
移動局
14.
基地局
11.
FA
15.
基地局
12.
FA
10.
HA
700. 移動
701. 位置登録
702. 位置登録を通知
703. 移動の検出
704. Agent Solicitation
705. Agent Advertisement
706. 位置登録の必要性の判断
707. 位置登録
708. 位置登録
709. 登録応答
710. 登録応答
711. MN18はパケット通信可能

【図１１】


移動
MN
～１８
MN
～１８
フォーリン
ネットワーク
～２１
FA
～１１
IP ネットワーク
～２３
HA
～１０
ホーム
ネットワーク
～２０
CN
～１９

【図１２】


18.
MN
11.
FA
10.
HA
1000. Agent Advertisement
1001. Agent Advertisement
1002. Agent Advertisement
1003. 移動
1004. Agent Advertisement
1005. 移動の検出
1006. 位置登録
1007. 位置登録
1008. 登録応答
1009. 登録応答
1010. MN１８は通信可能

# PATENT ABSTRACTS OF JAPAN

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**H04B 7/26**
**H04L 12/28**

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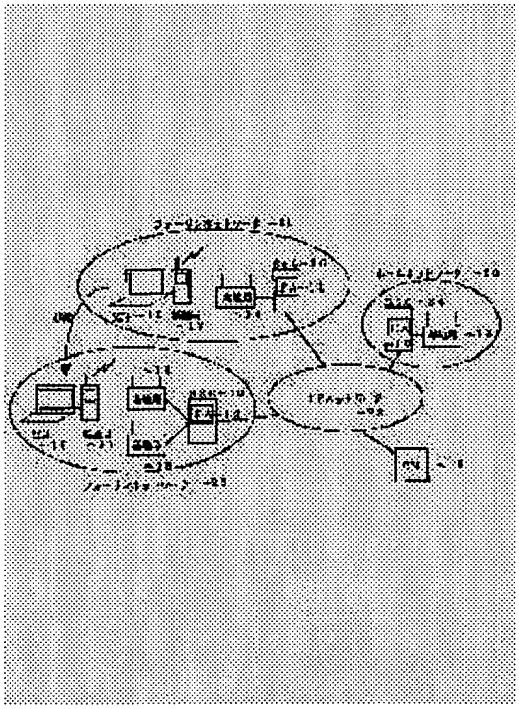
(71)Applicant : **MITSUBISHI ELECTRIC CORP**

(72)Inventor : **KINOSHITA YUSUKE**
**ITO SHUJI**

## (54) MOBILE TERMINAL POSITION REGISTRATION SYSTEM FOR MOBILE COMMUNICATION SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To detect the movement of a mobile terminal while effectively using the band of a radio channel by allowing the mobile station to transfers management information communicated between a base station and the mobile station to the connected mobile terminal and also allowing the mobile terminal to detect the movement of the mobile terminal between networks according to the transferred management information and registering the position at an agent.



SOLUTION: When a mobile station 17 and a mobile terminal MN 18 moves from a foreign network 21 to a foreign network 22, the mobile station 17 performs a hand-over operation and informs the MN 18 of the hand-over. The MN 8 sends a position registration message to a foreign agent FA 12 over a speaking channel and the FA 12 transfers it to a foreign agent HA 10. The HA 10 performs position registration so that the MN 18 is able to have a packet communication even in the network 22 at its destination. Messages need not be transmitted periodically and radio channels can effectively be used.

LEGAL STATUS

[Date of request for examination] 11.09.1997

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than

[the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3080039

[Date of registration] 23.06.2000

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

## TECHNICAL FIELD

[Field of the Invention] This invention relates to the location registration method in the packet communication system of PHS (Personal Handyphone System) which has the mobile station which moves freely for example, in the inside of a network, the migration terminal (below Mobile Node:, MN) connected to a mobile station, the base station which radiocommunicates with the mobile station concerned, the base station controller which manages the base station concerned, and the agent who performs location management of said migration terminal.

[Translation done.]

## PRIOR ART

[Description of the Prior Art] In order to guarantee a communication link when a terminal with IP (Internet Protocol) address straddled and moves in a network on LAN (Local Area Network) conventionally built with Ethernet, in IETF (Internet Engineering Task Force), Mobile-IP (RFC2002, "IP Mobility Support", RFC:Request For Comment) is proposed.

[0003] The network configuration in above-mentioned Mobile-IP is shown in drawing 11 . MN18 is a migration terminal which moves in a network, and CN(s) (Correspondent Node)19 are MN18 and a partner terminal which performs a communication link. HA (Home Agent)10 manages 20 and the home network in MN18 and 21 are foreign networks which FA (Forign Agent)11 manages. Moreover, 23 is the other IP network. HA10 exists in the home network 20 of MN18, and holds the location registration information with which network MN18 has connected now. HA10 is distributed to the foreign network 21 where the data is connected in MN18, when the data (IP packet) which made MN18 the destination are received from CN19. This is called tunneling. FA11 exists in the foreign network 21 where MN18 is connected temporarily, and hands over the data distributed by tunneling from HA10 to reception and MN18. Distribution (tunneling) of the data which make the destination MN18 from HA10 to FA11 is performed by capsulation. Capsulation is adding the header which makes HA10 to FA11 the destination to the outside of the data which make MN18 the destination. HA10 encapsulates the data which make MN18 the destination, and outputs the encapsulated data to the IP network 23. FA11 passes the data which make ejection reception and the data which carry out Di-capsulation and make MN18 the destination, and make MN18 the destination for the data encapsulated from the IP network 23 to MN18. In addition, HA10 and FA11 are named generically and it is only called an agent. In Mobile-IP, to MN18, two, a constant fixed IP address (home address) and the adjustable IP address (restorative address) assigned at the time of the migration which straddled the network, are assigned irrespective of migration, and location registration of the above MN18 is carried out to HA10 which exists the two above-mentioned addresses in the network of a home, and FA11 which has managed the network of a migration place. If the home address of the above MN18 is specified from CN19 and an IP packet is transmitted when MN18 exists in the foreign network 21, tunneling of the IP packet concerned will be carried out from the above HA 10 to FA11, and it will be delivered to MN18 which serves as the above-mentioned destination from FA11.

[0004] Moreover, since there is the need for registration modification of the restorative address of the above MN18 when MN18 moves to the network where the agents who have managed like the foreign network 21 from the home network 20 differ, as shown in drawing 11 , location registration needs to be needed and it is necessary to the above HA10 and FA11 to detect the above-mentioned migration by MN18 to the above HA10 and FA11, and to perform location registration from MN18.

[0005] As shown in drawing 11 , when MN18 moves to the foreign network 21 from a home network 20, the detection of migration and the sequence of location registration in Mobile-IP are shown in drawing 12 . It is Router of ICMP (Internet Control Message Protocol) of 1000-1002 by the format which shows HA10 to drawing 15 in drawing 12 . Agent which extended Discovery The Advertisement message is broadcast periodically. Agent An Advertisement message is a message which tells an agent's content of service. MN18 is Agent. The agent by whom the present is being connected can be known using an Advertisement message. Thus, MN18 gets to know the current position, when MN18 receives the above-mentioned message. In 1003, MN18 moves to the foreign network 21 from a home network 20. Then, MN18 is Agent of 1004 currently outputted more nearly periodically than FA11. While getting to know the current position by receiving an Advertisement message, it detects that MN18 moved to the foreign network 21 from the home network 20. MN18 which detected migration transmits

the location registration message of 1006 to FA11 in the format shown in drawing 13 . The carrier beam FA 11 transmits the location registration message of 1007 for the location registration message of 1006 to HA10. The above HA 10 which received the location registration message of 1007 transmits the registration response message of 1008 in the format shown in drawing 14 , after performing location registration processing, as MN18 can perform packet communication also in the foreign network 21. FA11 which received the registration response message by 1008 transmits the registration response message of 1009 to MN18, and MN18 receives a registration response message. Location registration is completed by the above and the packet communication of MN18 becomes possible in 1010.

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[Translation done.]

## EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, by using the information from a mobile station for detection of migration of MN as a trigger, the problem of broadcasting of the message between HA and FA, and MN can be solved, and a deployment of a wireless resource can be aimed at.
[0044] Moreover, when MN moves during packet communication, MN can perform location registration to HA or FA, ignited by the handover of a mobile station.
[0045] Moreover, when MN moves to except during a communication link, MN can perform location registration to HA or FA ignited by location registration processing of a mobile station.
[0046] Moreover, MN detects migration from ID of the base station in the positional information reported on the control channel, and the MN concerned can perform location registration to HA or FA.
[0047] Moreover, the information used for location registration processing is reported on a control channel, and MN can perform location registration to HA or FA using said information information.
[0048] Moreover, by using not a message channel but a control channel for location registration, a deployment of a message channel can be aimed at and the throughput of user data can be raised.
[0049] And in case location registration is performed, it is effective in useless location registration being avoidable by judging the need from the information on a control channel.
[0050] And in case location registration is performed, it is effective in useless location registration being avoidable by judging the need from an agent's information.
[0051] Moreover, according to this invention, it is effective in Mobile-IP of IETF being applicable to a PHS network.

## TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in PHS packet communication system, the network is constituted on radio, and it is Above Agent. Broadcasting an Advertisement message periodically on a network had a problem from a viewpoint of a band deployment of a radio channel. This invention aims at obtaining the location registration method which can perform migration detection of a migration terminal, aiming at [ are made in order to solve the above troubles, and ] a deployment of the band of the radio channel in a radio communications system.

[Translation done.]

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MEANS

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[Means for Solving the Problem] The location registration method of the migration terminal in the mobile communication system concerning this invention In the location registration method of the migration terminal in the mobile communication system equipped with two or more networks which have a base station with an agent, the mobile station which radiocommunicates with a base station, and the migration terminal connected to a mobile station A mobile station transmits the management information which communicates between a base station and a mobile station to a migration terminal, and it is characterized by for the above-mentioned migration terminal detecting migration between the networks of a migration terminal based on the transmitted management information, and carrying out location registration to an agent.
[0008] The above-mentioned management information is characterized by being the information which shows that handover processing of a mobile station occurred.
[0009] The above-mentioned management information is characterized by being the information which shows that location registration processing of a mobile station occurred.
[0010] The above-mentioned management information is characterized by being the identifier of the base station reported from a base station.
[0011] The above-mentioned management information is characterized by being the information used for the location registration reported from a base station.
[0012] The above-mentioned mobile station is characterized by transmitting the location registration message to the agent from the above-mentioned migration terminal using a control channel, and performing location registration of the above-mentioned migration terminal.
[0013] The above-mentioned mobile station is transmitted to the above-mentioned migration terminal by making into management information information reported to a control channel, and the above-mentioned migration terminal is characterized by judging the need for location registration based on the information reported to a control channel.
[0014] The above-mentioned migration terminal is characterized by judging the need for location registration by asking a network agent.
[0015] The above-mentioned mobile communication system is characterized by being the system which applied Mobile-IP of IETF (Internet Engineering Task Force) to Personal Handyphone System (PHS) packet communication system.
[0016]
[Embodiment of the Invention]
Based on a drawing, the location registration method in PHS packet communication system is explained as an example of this invention below gestalt 1. of operation. Drawing 1 is network configuration drawing showing the gestalt of 1 operation of PHS packet communication system. In drawing 1 , a home network 20 is a wireless zone which base station controllers (below Base Station Controller:, BSC) 24 which hold a base station 13 and the base station 13 connected to the IP network 23 are consisted of, and BSC24 manages. BSC24 is equipped with the function of HA10 which is the agent of Mobile-IP. Moreover, the foreign network 21 is a network which consisted of a base station 14 and BSC25 equipped with FA11 which is the agent of Mobile-IP, and existed before a mobile station 17 and MN18 moving, and is a wireless zone which BSC25 manages. Similarly, the foreign network 22 is a network which consists of base stations 15-16 and BSC26 equipped with FA12 which is the agent of Mobile-IP, and exists after a mobile station 17 and MN18 moving, and is a wireless zone which BSC26 manages. Moreover, it connects with the IP network 23 and the partner terminal (Correspondent Node: henceforth, CN) 19 which performs MN18 and packet communication exists.

[0017] At Mobile-IP, the IP packet transfer facility to a migration terminal is realized by the tunneling by capsulation of the packet by the agent. An agent has FA which manages a migration terminal in the subnetwork of HA which manages the current position of a migration terminal, and a migration place. The actuation at the time of a packet transfer of HA and FA is shown below.
HA: Encapsulate the IP packet addressed to a migration terminal, and transmit to FA.
FA: Extract the original IP packet from the transmitted packet, and transmit to a migration terminal.
In order to realize the packet transfer facility of PHS packet communication system, INTAWAKU of the agent who transmits an IP packet, and a PHS network is required. Therefore, in this system, an agent is stationed to BSC with an agent for simplification of INTAWAKU of a PHS network. The IP packet transfer facility concerned can be realized without not having effect of a functional addition etc. on IP network of drawing 1 , and needing newly the IP packet routing information from FA to BSC in FA by this.
[0018] In order to realize the above-mentioned packet transfer facility and to offer a mobility function, the migration function manager of a migration terminal is required for a system. Router according to ICMP (Internet Control Message Protocol) at Mobile-IP Agent which extended Discovery It registers by detecting migration using Advertisement/Solicitation. Agent which is this procedure at PHS packet communication system It is not appropriate from a viewpoint of a band deployment of a radio channel to broadcast Advertisement at fixed spacing as an IP packet. So, in this system, positional information is acquired using the management information for migration by PHS, and registration in Mobile-IP is performed by making into a trigger detection of the migration which straddles between BSC. It enables this not to give relation direct to PS number (telephone number) of a mobile station, and the IP address of a migration terminal to the migration function manager of this system.
[0019] In the network configuration shown in drawing 1 , drawing 2 shows the location registration sequence at the time of moving to the foreign network 22 from the foreign network 21, while the above MN18 performs the above CN19 and a communication link. Next, the location registration method in the PHS packet communication system shown in drawing 1 is explained using drawing 2 .
[0020] In 100 of drawing 2 , CN19 is performing MN18 and packet communication via the IP network 23, HA10 and FA11, the base station 14, and the mobile station 17. In 101, a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 102, the mobile station 17 concerned performs a handover by migration of 101. In 103, it notifies that the mobile station 17 concerned carried out the handover to MN18 concerned. The above MN18 detects migration between networks by getting to know that the mobile station 17 carried out the handover in 104.
[0021] MN18 which detected migration transmits the location registration message of 105 to FA12 using a message channel. A format of the location registration message of this Mobile-IP is shown in drawing 13 . The carrier beam above FA 12 transmits the location registration message of 106 for the location registration message of 105 to HA10. The above HA 10 which received the location registration message of 106 transmits the registration response message of 107, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. A format of the registration response message of this Mobile-IP is shown in drawing 14 . FA12 which received the registration response message by 107 transmits the registration response message of 108 to MN18 using a message channel, and MN18 receives a registration response. Location registration is completed by the above and CN19 comes during MN18 and packet communication in 109 via the IP network 23, HA10 and FA12, a base station 15, and a mobile station 17.
[0022] as mentioned above, the time of migration of the migration terminals MN, such as a personal computer (PC) which connected the mobile station with the gestalt of this operation, -- or Migration of a terminal in the network of a migration place to the time of migration of MN which added the function of a mobile station is managed. With the foreign agent who deletes IP header encapsulated by IP header including the IP address concerned, and hands an IP packet to MN In order to manage migration of MN in the network where MN originally exists and to enable an IP packet transfer at the time of migration When the assigned IP address was managed and the IP packet addressed to MN which moved is received, In the PHS packet communication network system possessing the home agent who encapsulates by IP header including the IP address assigned to the MN concerned When MN moves during packet communication, MN is characterized by performing location registration to HA or FA ignited by the handover of a mobile station.
[0023] By the above configurations, application of Mobile-IP of IETF (Internet Engineering Task Force) is attained at PHS packet communication system. That is, in PHS packet communication system, to the user of a migration terminal, migration can be concealed and it can communicate, without changing the

IP address given to the migration terminal in the network of a migration place. This system feature detects migration of MN by making migration of a mobile station 17 into a trigger. Therefore, it becomes unnecessary to transmit a message periodically and a radio channel can be used effectively.
[0024] In the network configuration shown in drawing 1 , the power source of the above-mentioned mobile station 17 is in the condition of ON, and gestalt 2. drawing 3 of operation is in the condition that the above MN18 is not communicating, and shows the location registration sequence at the time of moving to the foreign network 22 from the foreign network 21.
[0025] In 200 of drawing 3 , a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 201, it gets to know that the mobile station 17 moved in the wireless zone where oneself exists, and location registration as a mobile station is performed to a base station 15 (or base station 16). In 202, a mobile station 17 notifies that the mobile station 17 performed location registration to MN18. In 203, MN18 detects having moved between networks by getting to know having performed location registration with the connected new mobile station 17.
[0026] MN18 which detected having moved transmits the location registration message of 204 to FA12 of a migration place network using a message channel. FA12 which received the location registration message of 204 transmits the location registration message of 205 to HA10. HA10 which received the location registration message of 205 transmits the registration response message of 206 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 206 transmits the registration response message of 207 to MN18 using a message channel, and MN18 receives a registration response message. In 208, location registration is completed and the above enables MN18 to perform packet communication.
[0027] Gestalt 3. drawing 4 of operation shows a location registration sequence when the above MN18 moves to the foreign network 22 from the foreign network 21, uses a control channel for transmission and reception of a location registration message and performs location registration in the network configuration shown in drawing 1 . The arrow head of a broken line shows among drawing the communication link of the location registration message which used the control channel.
[0028] In 300 of drawing 4 , a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 301, it gets to know that the mobile station 17 moved in the wireless zone where oneself exists, and location registration as a mobile station is performed. In 302, a mobile station 17 notifies that the mobile station 17 performed location registration to MN18. In 303, MN18 detects having moved by getting to know that the connected mobile station 17 performed location registration.
[0029] MN18 which detected having moved transmits the location registration message of 304 to FA12 of a migration place network using a control channel. FA12 which received the location registration message of 304 transmits the location registration message of 305 to HA10. HA10 which received the location registration message of 305 transmits the registration response message of 306 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 306 transmits the registration response message of 307 to MN18 using a control channel, and MN18 receives a registration response message. In 308, location registration is completed and the above enables MN18 to perform packet communication.
[0030] In the network configuration which shows gestalt 4. drawing 5 of operation to drawing 1 , the above MN18 moves to the foreign network 22 from the foreign network 21, and MN shows the location registration sequence at the time of detecting migration from the information reported to the mobile station from the base station using the control channel. Here, CS-ID which is the identifier of a base station is in the information information reported to the mobile station from the above-mentioned base station. The conversion table of CS-ID assigned to drawing 6 in base stations 13-16 is shown. From drawing 6 , "1100" is assigned as CS-ID and, as for the base station 14, "1200" is assigned, as for the base station 15.
[0031] In 400 of drawing 5 , information is reported from the base station 14 to the mobile station 17. CS-ID of a base station 14 is contained in the above-mentioned information information, and the value is "1100" from drawing 6 . In 401, CS-ID of the zone a mobile station 17 recognizes [ a zone ] current existence to MN18 notifies that it is "1100." In 402, a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. In 403, a mobile station 17 receives information information and acquires CS-ID "1200" of a base station 15 from a base station 15. In 404, a mobile station 17 notifies that CS-ID of the zone which recognizes current existence is "1200" to MN18. By change of above-mentioned CS-ID, MN18 detects migration between networks in 405.

[0032] MN18 transmits the location registration message of 406 using a control channel to FA12 of a migration place network. FA12 which received the location registration message of 406 transmits the location registration message of 407 to HA10. HA10 which received the location registration message of 407 transmits the registration response message of 408 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message of 408 transmits the registration response message of 409 to MN18 using a control channel, and MN18 receives a registration response message. In 410, location registration is completed and the above enables MN18 to perform packet communication.

[0033] In the network configuration shown in drawing 1 , the above MN18 exists in the foreign network 22, and gestalt 5. drawing 7 of operation makes the information used for a mobile station from a base station at location registration using a control channel report, and shows the location registration sequence at the time of using the information concerned at the time of location registration. The IP address of HA and FA is defined in the information made to report to a mobile station from the above-mentioned base station. The conversion table of the IP address assigned to drawing 8 at HA10 and FA 11 and 12 is shown. From drawing 8 , "133.142.11.1" is assigned to FA11 as an IP address, and "133.143.12.1" is assigned to FA12 as an IP address.

[0034] In 500 of drawing 7 , the information used for location registration from a base station 15 to a mobile station 17 is reported. The IP address of FA12 is included in the above-mentioned information information, and the value is "133.143.12.1" from drawing 8 . In 501, a mobile station 17 notifies that the IP address of network FA which is recognizing current existence is "133.143.12.1" to MN18. MN18 sets the IP address "133.143.12.1" acquired by 501 as the restorative address (Care-of Address) of the location registration message of drawing 13 , and transmits the location registration message of 502 using a control channel to FA12. FA12 which received the location registration message of 502 transmits the location registration message of 503 to HA10. HA10 which received the location registration message of 503 transmits the registration response message of 504 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 504 transmits the registration response message of 505 to MN18 using a control channel, and MN18 receives a registration response message. In 506, location registration is completed and the above enables MN18 to perform packet communication.

[0035] In the network configuration shown in drawing 1 , the above MN18 moves to the foreign network 22 from the foreign network 21, and gestalt 6. drawing 9 of operation shows the location registration sequence at the time of making the information used for location registration report to a mobile station from a base station using a control channel.

[0036] In 600 of drawing 9 , the information used for location registration from a base station 14 to a mobile station 17 is reported. The IP address of FA11 is included in the above-mentioned information information, and the value is "133.142.11.1." In 601, it notifies that the mobile station 17 exists in the area of FA11 whose current IP address is "133.142.11.1" to MN18.

[0037] In 602, a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. In 603, the information used for location registration from a base station 15 to a mobile station 17 is reported like the above 600 using the control channel. The IP address of FA12 is included in the above-mentioned information information, and the value is "133.143.12.1." In 601, a mobile station 17 notifies existing in the area of FA12 whose current IP address is "133.143.12.1" to MN18. In 605, since the IP address of Above FA changed from "133.142.11.1" to "133.143.12.1", MN18 detects having moved to the foreign network 22 from the foreign network 21. In 606, since MN18 has detected having moved to the network which a different agent manages, it judges it that location registration is required.

[0038] Decision of the need for the location registration of 606 is applicable also to the gestalt of each operation mentioned above. If the IP address of FA becomes with "133.143.12.1" when MN18 moves to the wireless zone of a base station 16 from the wireless zone of a base station 15 (i.e., even when the handover was performed, location registration was performed or CS-ID is changed), it can be judged that it is not necessary to carry out location registration. Thus, migration detection of a mobile station 17 may not turn into migration detection of MN18 as it is. That is, it will dissociate and migration detection of a mobile station 17 and migration detection of MN18 will perform migration detection of MN18 separately by making migration detection of a mobile station 17 into a trigger.

[0039] MN18 sets the IP address "133.143.12.1" acquired by 604 as the restorative address (Care-of Address) of the location registration message of drawing 13 , and transmits the location registration

message of 607 using a control channel to FA12. FA12 which received the location registration message of 607 transmits the location registration message of 608 to HA10. HA10 which received the location registration message of 608 transmits the registration response message of 609 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 609 transmits the registration response message of 610 to MN18 using a control channel, and MN18 receives a registration response message. In 611, location registration is completed and the above enables MN18 to perform packet communication.

[0040] In the network configuration shown in drawing 1 , the above MN18 moves gestalt 7. drawing 10 of operation to the foreign network 22 from the foreign network 21, and using the information from an agent, MN18 shows the sequence in the case of performing location registration, after judging the need for location registration.

[0041] In 700 of drawing 10 , a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 701, it gets to know that the mobile station 17 moved in the wireless zone where oneself exists, and location registration as a mobile station is performed. In 702, a mobile station 17 notifies that the mobile station 17 performed location registration to MN18. In 703, MN18 detects having moved by getting to know that the connected mobile station 17 performed location registration.

[0042] MN18 which detected migration is Agent of 704 to FA12 by the format shown in drawing 16 . A Solicitation message is transmitted. Agent A Solicitation message is Agent. It is the message which requires issuance of a Solicitation message. FA12 which received the AgentSolicitation message of 704 is Agent of 705 by the format shown in drawing 15 . An Advertisement message is transmitted. Setting to 706, MN18 is Agent of 705. From the information on an Advertisement message, location registration judges need. When location registration is required, MN18 transmits the location registration message of 707 to FA12 using a control channel. FA12 which received the location registration message of 707 transmits a location registration message to HA10 in 708. HA10 which received the location registration message of 708 transmits the registration response message of 709 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 709 transmits the registration response message of 710 to MN18 using a control channel, and MN18 receives a registration response message. At the event of 711, MN18 completes location registration, and it enables MN18 to perform packet communication.

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[Translation done.]

## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the location registration method in the packet communication system of PHS (Personal Handyphone System) which has the mobile station which moves freely for example, in the inside of a network, the migration terminal (below Mobile Node:, MN) connected to a mobile station, the base station which radiocommunicates with the mobile station concerned, the base station controller which manages the base station concerned, and the agent who performs location management of said migration terminal.
[0002]
[Description of the Prior Art] In order to guarantee a communication link when a terminal with IP (Internet Protocol) address straddled and moves in a network on LAN (Local Area Network) conventionally built with Ethernet, in IETF (Internet Engineering Task Force), Mobile-IP (RFC2002, "IP Mobility Support", RFC:Request For Comment) is proposed.
[0003] The network configuration in above-mentioned Mobile-IP is shown in drawing 11 . MN18 is a migration terminal which moves in a network, and CN(s) (Correspondent Node)19 are MN18 and a partner terminal which performs a communication link. HA (Home Agent)10 manages 20 and the home network in MN18 and 21 are foreign networks which FA (Forign Agent)11 manages. Moreover, 23 is the other IP network. HA10 exists in the home network 20 of MN18, and holds the location registration information with which network MN18 has connected now. HA10 is distributed to the foreign network 21 where the data is connected in MN18, when the data (IP packet) which made MN18 the destination are received from CN19. This is called tunneling. FA11 exists in the foreign network 21 where MN18 is connected temporarily, and hands over the data distributed by tunneling from HA10 to reception and MN18. Distribution (tunneling) of the data which make the destination MN18 from HA10 to FA11 is performed by capsulation. Capsulation is adding the header which makes HA10 to FA11 the destination to the outside of the data which make MN18 the destination. HA10 encapsulates the data which make MN18 the destination, and outputs the encapsulated data to the IP network 23. FA11 passes the data which make ejection reception and the data which carry out Di capsulation and make MN18 the destination, and make MN18 the destination for the data encapsulated from the IP network 23 to MN18. In addition, HA10 and FA11 are named generically and it is only called an agent. In Mobile-IP, to MN18, two, a constant fixed IP address (home address) and the adjustable IP address (restorative address) assigned at the time of the migration which straddled the network, are assigned irrespective of migration, and location registration of the above MN18 is carried out to HA10 which exists the two above-mentioned addresses in the network of a home, and FA11 which has managed the network of a migration place. If the home address of the above MN18 is specified from CN19 and an IP packet is transmitted when MN18 exists in the foreign network 21, tunneling of the IP packet concerned will be carried out from the above HA 10 to FA11, and it will be delivered to MN18 which serves as the above-mentioned destination from FA11.
[0004] Moreover, since there is the need for registration modification of the restorative address of the above MN18 when MN18 moves to the network where the agents who have managed like the foreign network 21 from the home network 20 differ, as shown in drawing 11 , location registration needs to be needed and it is necessary to the above HA10 and FA11 to detect the above-mentioned migration by MN18 to the above HA10 and FA11, and to perform location registration from MN18.
[0005] As shown in drawing 11 , when MN18 moves to the foreign network 21 from a home network 20, the detection of migration and the sequence of location registration in Mobile-IP are shown in

drawing 12 . It is Router of ICMP (Internet Control Message Protocol) of 1000-1002 by the format which shows HA10 to drawing 15 in drawing 12 . Agent which extended Discovery The Advertisement message is broadcast periodically. Agent An Advertisement message is a message which tells an agent's content of service. MN18 is Agent. The agent by whom the present is being connected can be known using an Advertisement message. Thus, MN18 gets to know the current position, when MN18 receives the above-mentioned message. In 1003, MN18 moves to the foreign network 21 from a home network 20. Then, MN18 is Agent of 1004 currently outputted more nearly periodically than FA11. While getting to know the current position by receiving an Advertisement message, it detects that MN18 moved to the foreign network 21 from the home network 20. MN18 which detected migration transmits the location registration message of 1006 to FA11 in the format shown in drawing 13 . The carrier beam FA 11 transmits the location registration message of 1007 for the location registration message of 1006 to HA10. The above HA 10 which received the location registration message of 1007 transmits the registration response message of 1008 in the format shown in drawing 14 , after performing location registration processing, as MN18 can perform packet communication also in the foreign network 21. FA11 which received the registration response message by 1008 transmits the registration response message of 1009 to MN18, and MN18 receives a registration response message. Location registration is completed by the above and the packet communication of MN18 becomes possible in 1010.

[0006]

[Problem(s) to be Solved by the Invention] However, in PHS packet communication system, the network is constituted on radio, and it is Above Agent. Broadcasting an Advertisement message periodically on a network had a problem from a viewpoint of a band deployment of a radio channel. This invention aims at obtaining the location registration method which can perform migration detection of a migration terminal, aiming at [ are made in order to solve the above troubles, and ] a deployment of the band of the radio channel in a radio communications system.

[0007]

[Means for Solving the Problem] The location registration method of the migration terminal in the mobile communication system concerning this invention In the location registration method of the migration terminal in the mobile communication system equipped with two or more networks which have a base station with an agent, the mobile station which radiocommunicates with a base station, and the migration terminal connected to a mobile station A mobile station transmits the management information which communicates between a base station and a mobile station to a migration terminal, and it is characterized by for the above-mentioned migration terminal detecting migration between the networks of a migration terminal based on the transmitted management information, and carrying out location registration to an agent.

[0008] The above-mentioned management information is characterized by being the information which shows that handover processing of a mobile station occurred.

[0009] The above-mentioned management information is characterized by being the information which shows that location registration processing of a mobile station occurred.

[0010] The above-mentioned management information is characterized by being the identifier of the base station reported from a base station.

[0011] The above-mentioned management information is characterized by being the information used for the location registration reported from a base station.

[0012] The above-mentioned mobile station is characterized by transmitting the location registration message to the agent from the above-mentioned migration terminal using a control channel, and performing location registration of the above-mentioned migration terminal.

[0013] The above-mentioned mobile station is transmitted to the above-mentioned migration terminal by making into management information information reported to a control channel, and the above-mentioned migration terminal is characterized by judging the need for location registration based on the information reported to a control channel.

[0014] The above-mentioned migration terminal is characterized by judging the need for location registration by asking a network agent.

[0015] The above-mentioned mobile communication system is characterized by being the system which applied Mobile-IP of IETF (Internet Engineering Task Force) to Personal Handyphone System (PHS) packet communication system.

[0016]

[Embodiment of the Invention]

Based on a drawing, the location registration method in PHS packet communication system is explained

as an example of this invention below gestalt 1. of operation. Drawing 1 is network configuration drawing showing the gestalt of 1 operation of PHS packet communication system. In drawing 1 , a home network 20 is a wireless zone which base station controllers (below Base Station Controller:, BSC) 24 which hold a base station 13 and the base station 13 connected to the IP network 23 are consisted of, and BSC24 manages. BSC24 is equipped with the function of HA10 which is the agent of Mobile-IP. Moreover, the foreign network 21 is a network which consisted of a base station 14 and BSC25 equipped with FA11 which is the agent of Mobile-IP, and existed before a mobile station 17 and MN18 moving, and is a wireless zone which BSC25 manages. Similarly, the foreign network 22 is a network which consists of base stations 15-16 and BSC26 equipped with FA12 which is the agent of Mobile-IP, and exists after a mobile station 17 and MN18 moving, and is a wireless zone which BSC26 manages. Moreover, it connects with the IP network 23 and the partner terminal (Correspondent Node: henceforth, CN) 19 which performs MN18 and packet communication exists.

[0017] At Mobile-IP, the IP packet transfer facility to a migration terminal is realized by the tunneling by capsulation of the packet by the agent. An agent has FA which manages a migration terminal in the subnetwork of HA which manages the current position of a migration terminal, and a migration place. The actuation at the time of a packet transfer of HA and FA is shown below.

HA: Encapsulate the IP packet addressed to a migration terminal, and transmit to FA.

FA: Extract the original IP packet from the transmitted packet, and transmit to a migration terminal.

In order to realize the packet transfer facility of PHS packet communication system, INTAWAKU of the agent who transmits an IP packet, and a PHS network is required. Therefore, in this system, an agent is stationed to BSC with an agent for simplification of INTAWAKU of a PHS network. The IP packet transfer facility concerned can be realized without not having effect of a functional addition etc. on IP network of drawing 1 , and needing newly the IP packet routing information from FA to BSC in FA by this.

[0018] In order to realize the above-mentioned packet transfer facility and to offer a mobility function, the migration function manager of a migration terminal is required for a system. Router according to ICMP (Internet Control Message Protocol) at Mobile-IP Agent which extended Discovery It registers by detecting migration using Advertisement/Solicitation. Agent which is this procedure at PHS packet communication system It is not appropriate from a viewpoint of a band deployment of a radio channel to broadcast Advertisement at fixed spacing as an IP packet. So, in this system, positional information is acquired using the management information for migration by PHS, and registration in Mobile-IP is performed by making into a trigger detection of the migration which straddles between BSC. It enables this not to give relation direct to PS number (telephone number) of a mobile station, and the IP address of a migration terminal to the migration function manager of this system.

[0019] In the network configuration shown in drawing 1 , drawing 2 shows the location registration sequence at the time of moving to the foreign network 22 from the foreign network 21, while the above MN18 performs the above CN19 and a communication link. Next, the location registration method in the PHS packet communication system shown in drawing 1 is explained using drawing 2 .

[0020] In 100 of drawing 2 , CN19 is performing MN18 and packet communication via the IP network 23, HA10 and FA11, the base station 14, and the mobile station 17. In 101, a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 102, the mobile station 17 concerned performs a handover by migration of 101. In 103, it notifies that the mobile station 17 concerned carried out the handover to MN18 concerned. The above MN18 detects migration between networks by getting to know that the mobile station 17 carried out the handover in 104.

[0021] MN18 which detected migration transmits the location registration message of 105 to FA12 using a message channel. A format of the location registration message of this Mobile-IP is shown in drawing 13 . The carrier beam above FA 12 transmits the location registration message of 106 for the location registration message of 105 to HA10. The above HA 10 which received the location registration message of 106 transmits the registration response message of 107, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. A format of the registration response message of this Mobile-IP is shown in drawing 14 . FA12 which received the registration response message by 107 transmits the registration response message of 108 to MN18 using a message channel, and MN18 receives a registration response. Location registration is completed by the above and CN19 comes during MN18 and packet communication in 109 via the IP network 23, HA10 and FA12, a base station 15, and a mobile station 17.

[0022] as mentioned above, the time of migration of the migration terminals MN, such as a personal computer (PC) which connected the mobile station with the gestalt of this operation, -- or Migration of a

terminal in the network of a migration place to the time of migration of MN which added the function of a mobile station is managed. With the foreign agent who deletes IP header encapsulated by IP header including the IP address concerned, and hands an IP packet to MN In order to manage migration of MN in the network where MN originally exists and to enable an IP packet transfer at the time of migration When the assigned IP address was managed and the IP packet addressed to MN which moved is received, In the PHS packet communication network system possessing the home agent who encapsulates by IP header including the IP address assigned to the MN concerned When MN moves during packet communication, MN is characterized by performing location registration to HA or FA ignited by the handover of a mobile station.

[0023] By the above configurations, application of Mobile-IP of IETF (Internet Engineering Task Force) is attained at PHS packet communication system. That is, in PHS packet communication system, to the user of a migration terminal, migration can be concealed and it can communicate, without changing the IP address given to the migration terminal in the network of a migration place. This system feature detects migration of MN by making migration of a mobile station 17 into a trigger. Therefore, it becomes unnecessary to transmit a message periodically and a radio channel can be used effectively.

[0024] In the network configuration shown in drawing 1 , the power source of the above-mentioned mobile station 17 is in the condition of ON, and gestalt 2. drawing 3 of operation is in the condition that the above MN18 is not communicating, and shows the location registration sequence at the time of moving to the foreign network 22 from the foreign network 21.

[0025] In 200 of drawing 3 , a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 201, it gets to know that the mobile station 17 moved in the wireless zone where oneself exists, and location registration as a mobile station is performed to a base station 15 (or base station 16). In 202, a mobile station 17 notifies that the mobile station 17 performed location registration to MN18. In 203, MN18 detects having moved between networks by getting to know having performed location registration with the connected new mobile station 17.

[0026] MN18 which detected having moved transmits the location registration message of 204 to FA12 of a migration place network using a message channel. FA12 which received the location registration message of 204 transmits the location registration message of 205 to HA10. HA10 which received the location registration message of 205 transmits the registration response message of 206 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 206 transmits the registration response message of 207 to MN18 using a message channel, and MN18 receives a registration response message. In 208, location registration is completed and the above enables MN18 to perform packet communication.

[0027] Gestalt 3. drawing 4 of operation shows a location registration sequence when the above MN18 moves to the foreign network 22 from the foreign network 21, uses a control channel for transmission and reception of a location registration message and performs location registration in the network configuration shown in drawing 1 . The arrow head of a broken line shows among drawing the communication link of the location registration message which used the control channel.

[0028] In 300 of drawing 4 , a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 301, it gets to know that the mobile station 17 moved in the wireless zone where oneself exists, and location registration as a mobile station is performed. In 302, a mobile station 17 notifies that the mobile station 17 performed location registration to MN18. In 303, MN18 detects having moved by getting to know that the connected mobile station 17 performed location registration.

[0029] MN18 which detected having moved transmits the location registration message of 304 to FA12 of a migration place network using a control channel. FA12 which received the location registration message of 304 transmits the location registration message of 305 to HA10. HA10 which received the location registration message of 305 transmits the registration response message of 306 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 306 transmits the registration response message of 307 to MN18 using a control channel, and MN18 receives a registration response message. In 308, location registration is completed and the above enables MN18 to perform packet communication.

[0030] In the network configuration which shows gestalt 4. drawing 5 of operation to drawing 1 , the above MN18 moves to the foreign network 22 from the foreign network 21, and MN shows the location registration sequence at the time of detecting migration from the information reported to the mobile station from the base station using the control channel. Here, CS-ID which is the identifier of a base

station is in the information information reported to the mobile station from the above-mentioned base station. The conversion table of CS-ID assigned to drawing 6 in base stations 13-16 is shown. From drawing 6 , "1100" is assigned as CS-ID and, as for the base station 14, "1200" is assigned, as for the base station 15.

[0031] In 400 of drawing 5 , information is reported from the base station 14 to the mobile station 17. CS-ID of a base station 14 is contained in the above-mentioned information information, and the value is "1100" from drawing 6 . In 401, CS-ID of the zone a mobile station 17 recognizes [ a zone ] current existence to MN18 notifies that it is "1100." In 402, a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. In 403, a mobile station 17 receives information information and acquires CS-ID "1200" of a base station 15 from a base station 15. In 404, a mobile station 17 notifies that CS-ID of the zone which recognizes current existence is "1200" to MN18. By change of above-mentioned CS-ID, MN18 detects migration between networks in 405.

[0032] MN18 transmits the location registration message of 406 using a control channel to FA12 of a migration place network. FA12 which received the location registration message of 406 transmits the location registration message of 407 to HA10. HA10 which received the location registration message of 407 transmits the registration response message of 408 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message of 408 transmits the registration response message of 409 to MN18 using a control channel, and MN18 receives a registration response message. In 410, location registration is completed and the above enables MN18 to perform packet communication.

[0033] In the network configuration shown in drawing 1 , the above MN18 exists in the foreign network 22, and gestalt 5. drawing 7 of operation makes the information used for a mobile station from a base station at location registration using a control channel report, and shows the location registration sequence at the time of using the information concerned at the time of location registration. The IP address of HA and FA is defined in the information made to report to a mobile station from the above-mentioned base station. The conversion table of the IP address assigned to drawing 8 at HA10 and FA 11 and 12 is shown. From drawing 8 , "133.142.11.1" is assigned to FA11 as an IP address, and "133.143.12.1" is assigned to FA12 as an IP address.

[0034] In 500 of drawing 7 , the information used for location registration from a base station 15 to a mobile station 17 is reported. The IP address of FA12 is included in the above-mentioned information information, and the value is "133.143.12.1" from drawing 8 . In 501, a mobile station 17 notifies that the IP address of network FA which is recognizing current existence is "133.143.12.1" to MN18. MN18 sets the IP address "133.143.12.1" acquired by 501 as the restorative address (Care-of Address) of the location registration message of drawing 13 , and transmits the location registration message of 502 using a control channel to FA12. FA12 which received the location registration message of 502 transmits the location registration message of 503 to HA10. HA10 which received the location registration message of 503 transmits the registration response message of 504 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 504 transmits the registration response message of 505 to MN18 using a control channel, and MN18 receives a registration response message. In 506, location registration is completed and the above enables MN18 to perform packet communication.

[0035] In the network configuration shown in drawing 1 , the above MN18 moves to the foreign network 22 from the foreign network 21, and gestalt 6. drawing 9 of operation shows the location registration sequence at the time of making the information used for location registration report to a mobile station from a base station using a control channel.

[0036] In 600 of drawing 9 , the information used for location registration from a base station 14 to a mobile station 17 is reported. The IP address of FA11 is included in the above-mentioned information information, and the value is "133.142.11.1." In 601, it notifies that the mobile station 17 exists in the area of FA11 whose current IP address is "133.142.11.1" to MN18.

[0037] In 602, a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. In 603, the information used for location registration from a base station 15 to a mobile station 17 is reported like the above 600 using the control channel. The IP address of FA12 is included in the above-mentioned information information, and the value is "133.143.12.1." In 601, a mobile station 17 notifies existing in the area of FA12 whose current IP address is "133.143.12.1" to MN18. In 605, since the IP address of Above FA changed from "133.142.11.1" to "133.143.12.1", MN18 detects having moved to

the foreign network 22 from the foreign network 21. In 606, since MN18 has detected having moved to the network which a different agent manages, it judges it that location registration is required.
[0038] Decision of the need for the location registration of 606 is applicable also to the gestalt of each operation mentioned above. If the IP address of FA becomes with "133.143.12.1" when MN18 moves to the wireless zone of a base station 16 from the wireless zone of a base station 15 (i.e., even when the handover was performed, location registration was performed or CS-ID is changed), it can be judged that it is not necessary to carry out location registration. Thus, migration detection of a mobile station 17 may not turn into migration detection of MN18 as it is. That is, it will dissociate and migration detection of a mobile station 17 and migration detection of MN18 will perform migration detection of MN18 separately by making migration detection of a mobile station 17 into a trigger.
[0039] MN18 sets the IP address "133.143.12.1" acquired by 604 as the restorative address (Care-of Address) of the location registration message of drawing 13 , and transmits the location registration message of 607 using a control channel to FA12. FA12 which received the location registration message of 607 transmits the location registration message of 608 to HA10. HA10 which received the location registration message of 608 transmits the registration response message of 609 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 609 transmits the registration response message of 610 to MN18 using a control channel, and MN18 receives a registration response message. In 611, location registration is completed and the above enables MN18 to perform packet communication.
[0040] In the network configuration shown in drawing 1 , the above MN18 moves gestalt 7. drawing 10 of operation to the foreign network 22 from the foreign network 21, and using the information from an agent, MN18 shows the sequence in the case of performing location registration, after judging the need for location registration.
[0041] In 700 of drawing 10 , a mobile station 17 and MN18 move to the foreign network 22 from the foreign network 21. By 701, it gets to know that the mobile station 17 moved in the wireless zone where oneself exists, and location registration as a mobile station is performed. In 702, a mobile station 17 notifies that the mobile station 17 performed location registration to MN18. In 703, MN18 detects having moved by getting to know that the connected mobile station 17 performed location registration.
[0042] MN18 which detected migration is Agent of 704 to FA12 by the format shown in drawing 16 . A Solicitation message is transmitted. Agent A Solicitation message is Agent. It is the message which requires issuance of a Solicitation message. FA12 which received the AgentSolicitation message of 704 is Agent of 705 by the format shown in drawing 15 . An Advertisement message is transmitted. Setting to 706, MN18 is Agent of 705. From the information on an Advertisement message, location registration judges need. When location registration is required, MN18 transmits the location registration message of 707 to FA12 using a control channel. FA12 which received the location registration message of 707 transmits a location registration message to HA10 in 708. HA10 which received the location registration message of 708 transmits the registration response message of 709 to FA12, after performing location registration processing, as MN18 can perform packet communication also in the migration place foreign network 22. FA12 which received the registration response message by 709 transmits the registration response message of 710 to MN18 using a control channel, and MN18 receives a registration response message. At the event of 711, MN18 completes location registration, and it enables MN18 to perform packet communication.
[0043]
[Effect of the Invention] According to this invention, by using the information from a mobile station for detection of migration of MN as a trigger, the problem of broadcasting of the message between HA and FA, and MN can be solved, and a deployment of a wireless resource can be aimed at.
[0044] Moreover, when MN moves during packet communication, MN can perform location registration to HA or FA ignited by the handover of a mobile station.
[0045] Moreover, when MN moves to except during a communication link, MN can perform location registration to HA or FA ignited by location registration processing of a mobile station.
[0046] Moreover, MN detects migration from ID of the base station in the positional information reported on the control channel, and the MN concerned can perform location registration to HA or FA.
[0047] Moreover, the information used for location registration processing is reported on a control channel, and MN can perform location registration to HA or FA using said information information.
[0048] Moreover, by using not a message channel but a control channel for location registration, a deployment of a message channel can be aimed at and the throughput of user data can be raised.

[0049] And in case location registration is performed, it is effective in useless location registration being avoidable by judging the need from the information on a control channel.
[0050] And in case location registration is performed, it is effective in useless location registration being avoidable by judging the need from an agent's information.
[0051] Moreover, according to this invention, it is effective in Mobile-IP of IETF being applicable to a PHS network.

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[Translation done.]

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is network configuration drawing of the PHS packet communication system in this invention.
[Drawing 2] It is drawing showing the location registration sequence in the gestalt 1 of implementation of this invention.
[Drawing 3] It is drawing showing the location registration sequence in the gestalt 2 of implementation of this invention.
[Drawing 4] It is drawing showing the location registration sequence in the gestalt 3 of implementation of this invention.
[Drawing 5] It is drawing showing the location registration sequence in the gestalt 4 of implementation of this invention.
[Drawing 6] It is drawing showing the conversion table of the base station in the gestalt 4 of implementation of this invention, and CS-ID.
[Drawing 7] It is drawing showing the location registration sequence in the gestalt 5 of implementation of this invention.
[Drawing 8] It is drawing showing the conversion table of the IP address of Agent in the gestalt 5 of implementation of this invention, and Agent.
[Drawing 9] It is drawing showing the location registration sequence in the gestalt 6 of implementation of this invention.
[Drawing 10] It is drawing showing the location registration sequence in the gestalt 7 of implementation of this invention.
[Drawing 11] It is network configuration drawing in conventional Mobile-IP.
[Drawing 12] It is drawing showing the location registration sequence in conventional Mobile-IP.
[Drawing 13] It is drawing showing the location registration message format in Mobile-IP.
[Drawing 14] It is drawing showing the registration response message format in Mobile-IP.
[Drawing 15] Agent in Mobile-IP It is drawing showing an Advertisement message format.
[Drawing 16] Agent in Mobile-IP It is drawing showing a Solicitation message format.
[Description of Notations]
10 11 HA (home agent), 12 FA (foreign agent), 13-16 A base station, 17 A mobile station, 18 MN (migration terminal), 19CN, 20 21 A home network, 22 A foreign network, 23IP network.

## CLAIMS

[Claim(s)]
[Claim 1] Two or more networks which have a base station with an agent The mobile station which radiocommunicates with a base station The migration terminal connected to a mobile station It is the location registration method of the migration terminal in the mobile communication system equipped with the above, and a mobile station transmits the management information which communicates between a base station and a mobile station to a migration terminal, and it is characterized by for the above-mentioned migration terminal detecting migration between the networks of a migration terminal based on the transmitted management information, and carrying out location registration to an agent.
[Claim 2] The above-mentioned management information is the location registration method of the migration terminal in the mobile communication system according to claim 1 characterized by being the information which shows that handover processing of a mobile station occurred.
[Claim 3] The above-mentioned management information is the location registration method of the migration terminal in the mobile communication system according to claim 1 characterized by being the information which shows that location registration processing of a mobile station occurred.
[Claim 4] The above-mentioned management information is the location registration method of the migration terminal in the mobile communication system according to claim 1 characterized by being the identifier of the base station reported from a base station.
[Claim 5] The above-mentioned management information is the location registration method of the migration terminal in the mobile communication system according to claim 1 characterized by being the information used for the location registration reported from a base station.
[Claim 6] claims 1-5 characterized by for the above-mentioned mobile station transmitting the location registration message to the agent from the above-mentioned migration terminal using a control channel, and performing location registration of the above-mentioned migration terminal -- the location registration method of the migration terminal in mobile communication system given in either.
[Claim 7] claims 1-6 characterized by transmitting the above-mentioned mobile station to the above-mentioned migration terminal by making into management information information reported to a control channel, and the above-mentioned migration terminal judging the need for location registration based on the information reported to a control channel -- the location registration method of the migration terminal in mobile communication system given in either.
[Claim 8] claims 1-6 characterized by the above-mentioned migration terminal judging the need for location registration by asking a network agent -- the location registration method of the migration terminal in mobile communication system given in either.
[Claim 9] Mobile communication system is the location registration method of the migration terminal in the mobile communication system according to claim 1 characterized by being the system which applied Mobile-IP of IETF (Internet Engineering Task Force) to Personal Handyphone System (PHS) packet communication system.

[Translation done.]

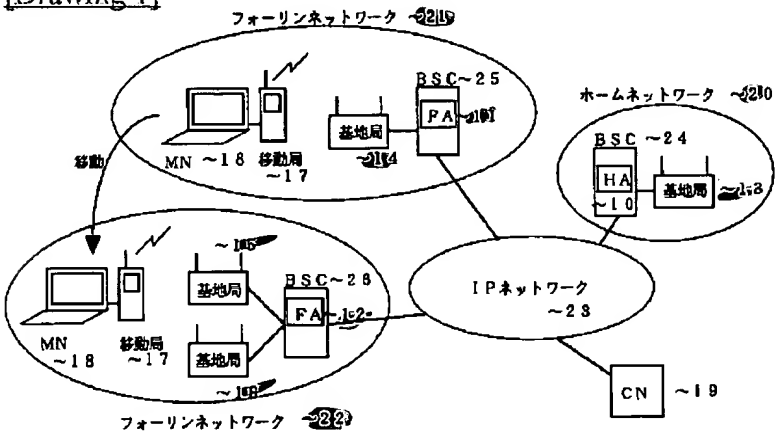
* NOTICES *



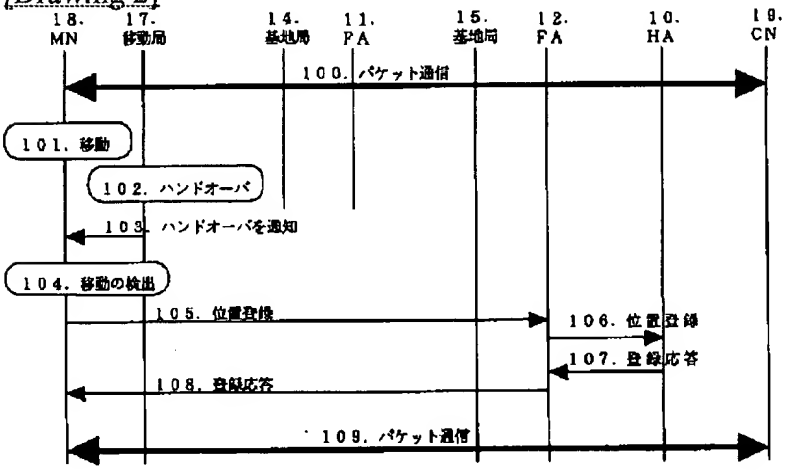
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

## DRAWINGS

[Drawing 1]




[Drawing 2]



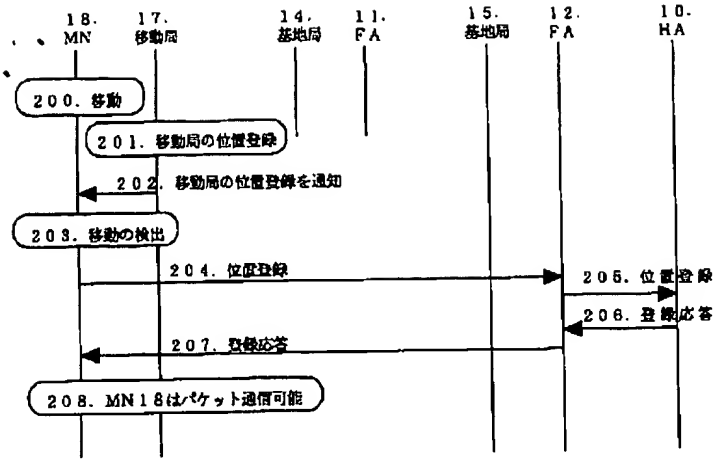

[Drawing 6]

| 基地局 | CS-ID |
|---|---|
| 基地局 13 | 1000 |
| 基地局 14 | 1100 |
| 基地局 15 | 1200 |
| 基地局 16 | 1300 |

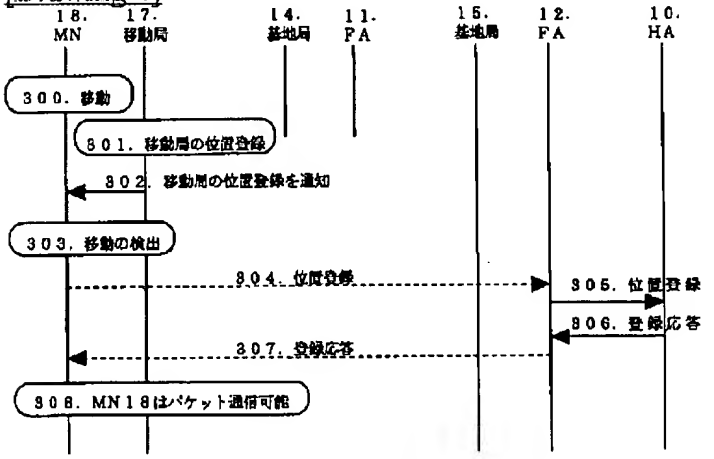
[Drawing 8]

| Agent | AgentのIPアドレス |
|---|---|
| HA 10 | 133. 141. 10. 1 |
| FA 11 | 133. 142. 11. 1 |
| FA 12 | 133. 143. 12. 1 |

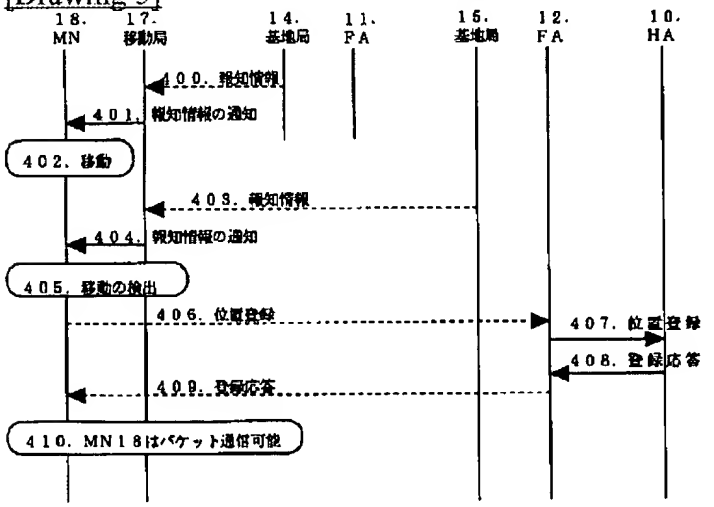
[Drawing 3]



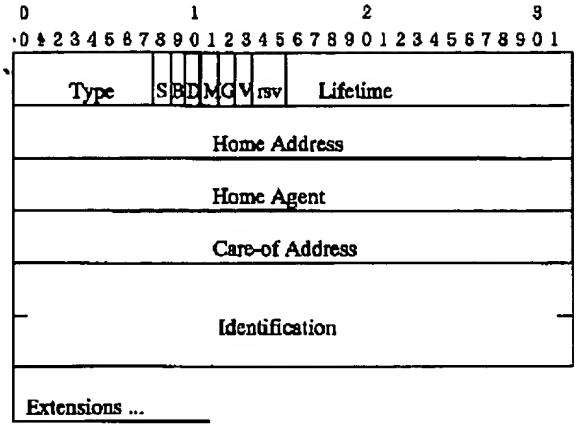

[Drawing 4]



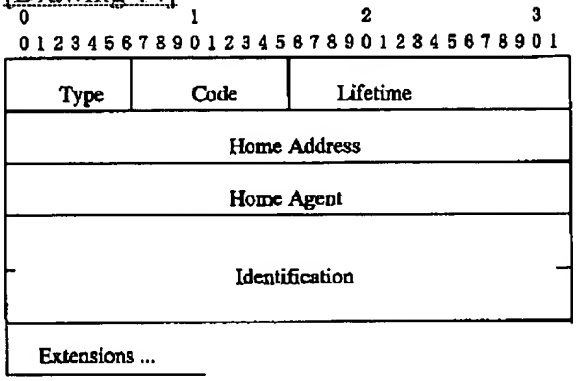

[Drawing 5]



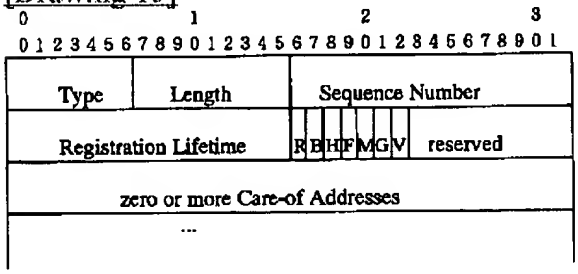

[Drawing 13]



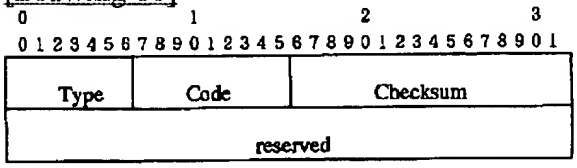

[Drawing 14]



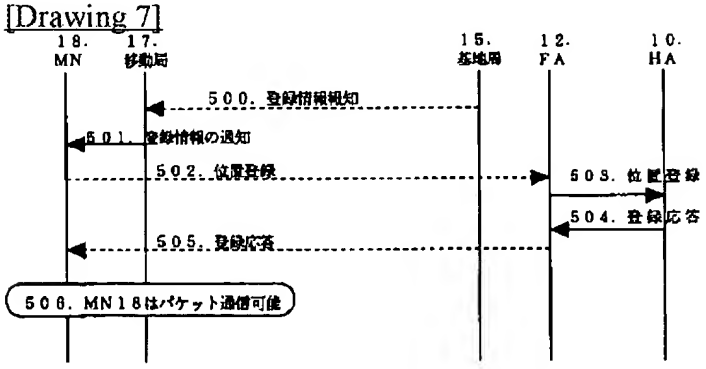

[Drawing 15]



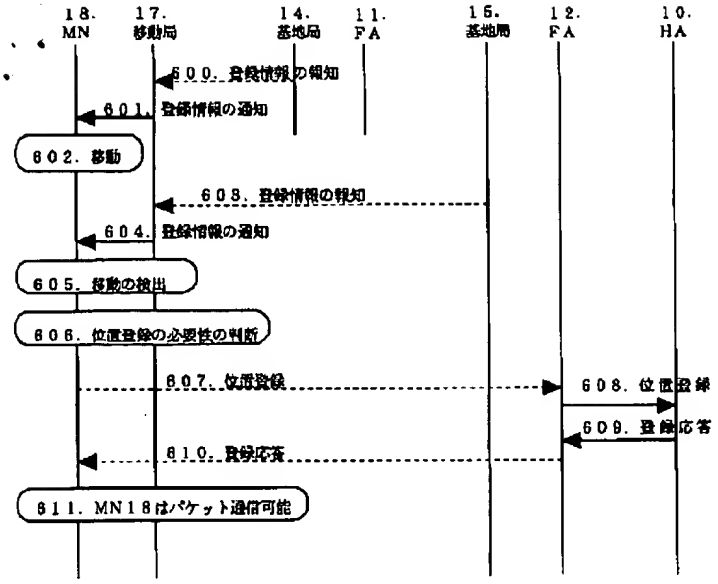

[Drawing 16]



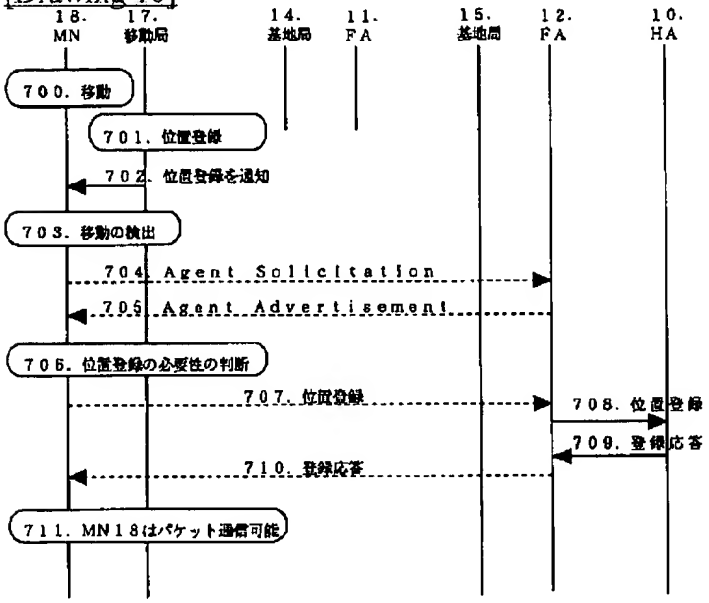

[Drawing 7]



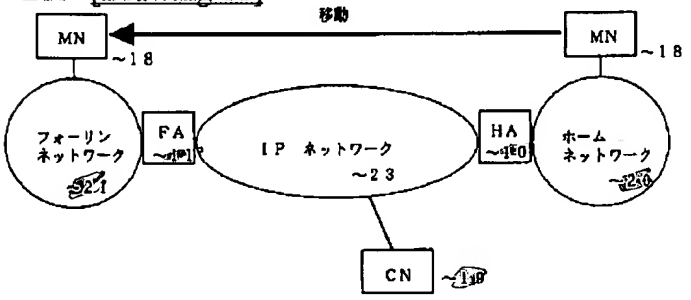

[Drawing 9]



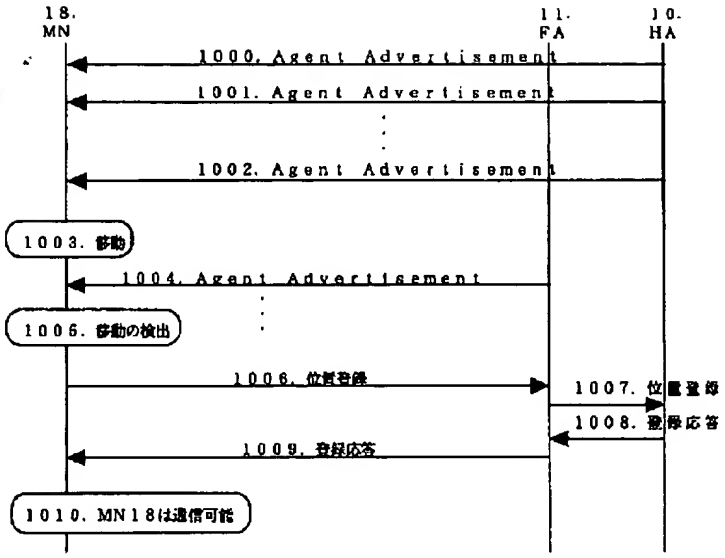

[Drawing 10]




<BR> [Drawing 11]




[Drawing 12]




[Translation done.]